february 1953

THE FOUNDRYMEN'S OWN MAGAZINE

American Foundryman

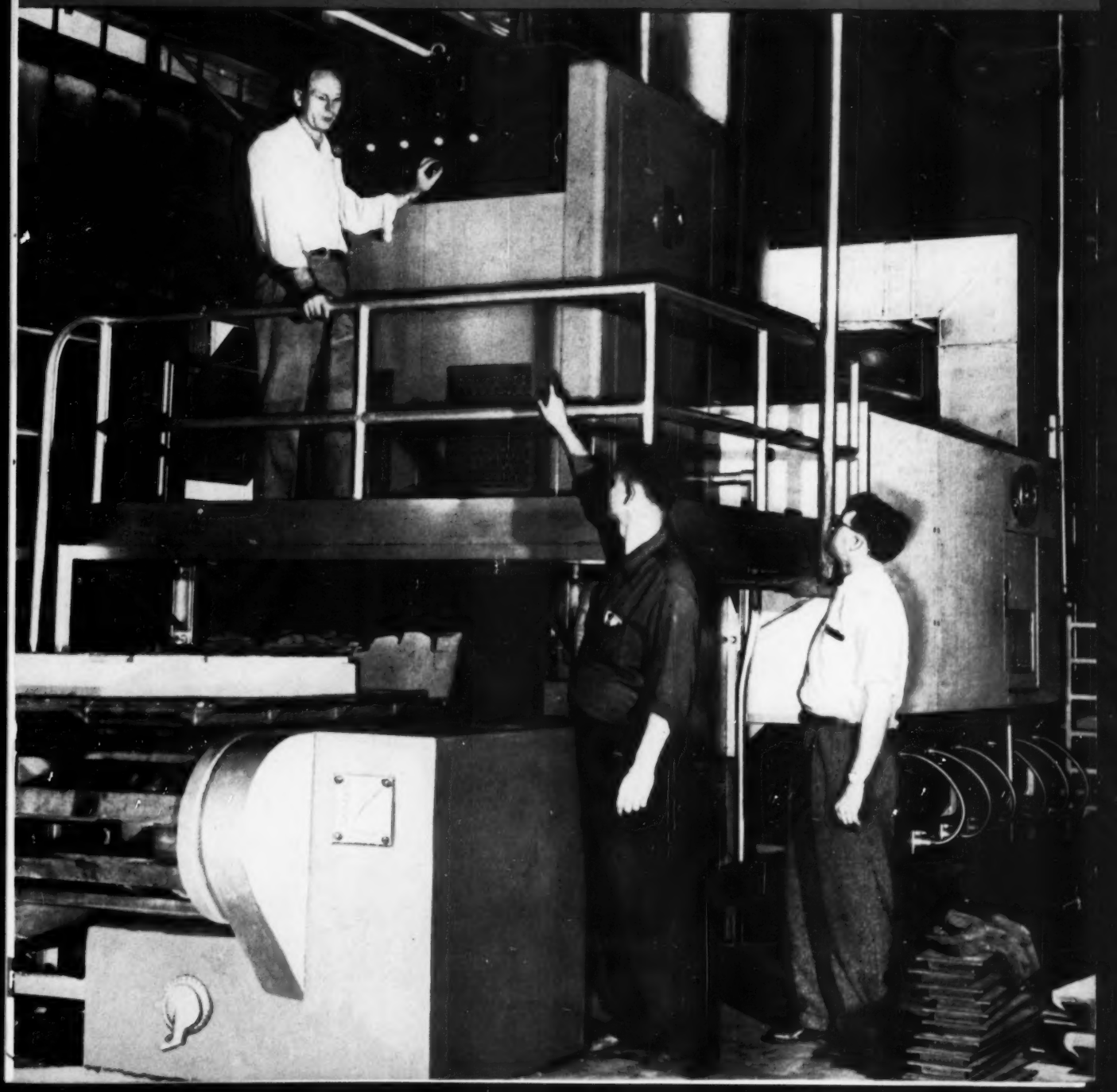
36 Castings with a pedigree

39 Current status of '53 Convention program

41 Cupola controls for fast melting, clean air

44 Complete itineraries for "Paris in '53" tours

69 Practical heat transfer



"'Specials' are routine... with our *Lectromelt* furnace"

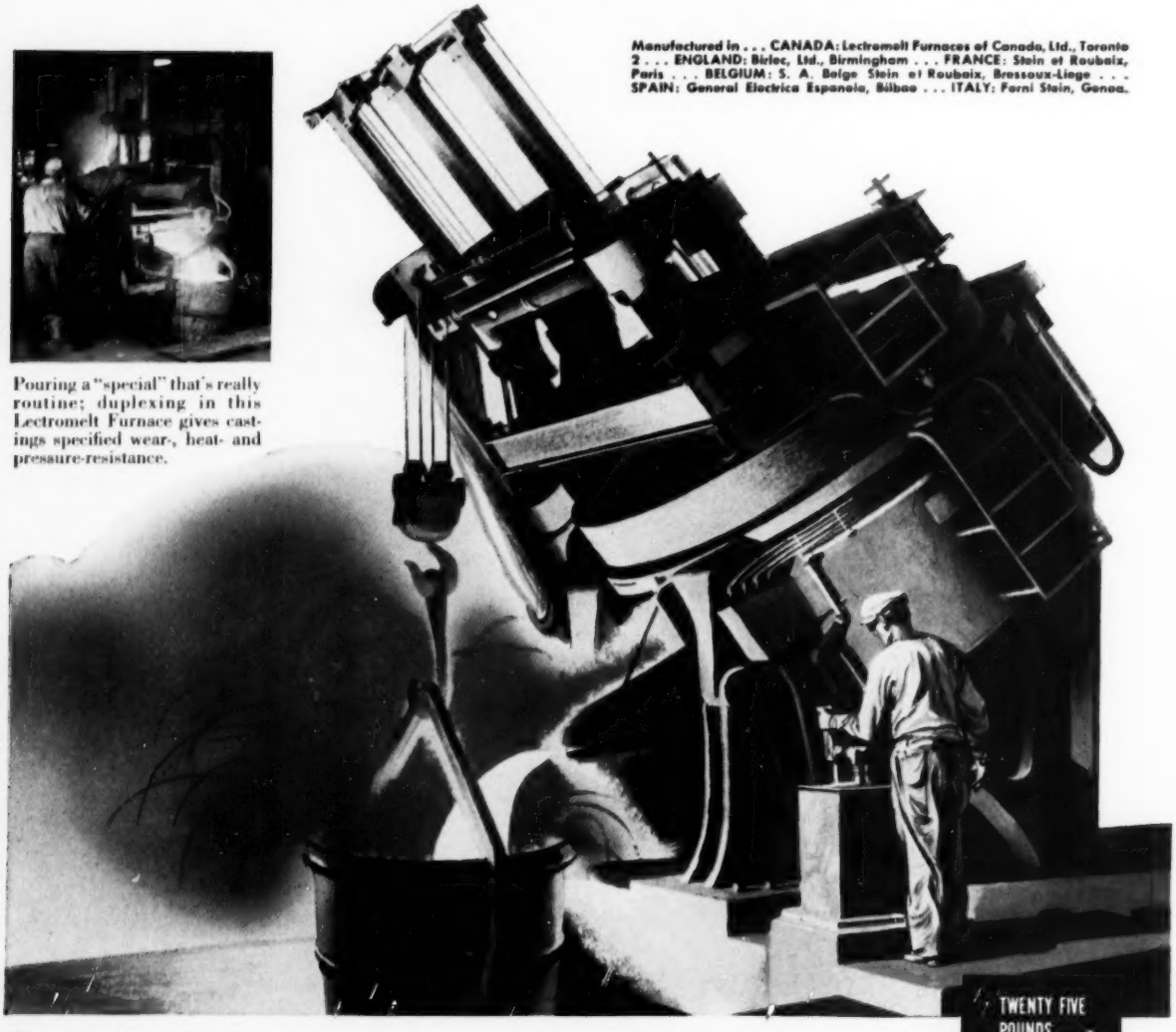
"'Special' irons for 'special' castings are actually routine production in our factory," says one gray iron foundry plant engineer. His chief metallurgist adds, "The electric furnace process is the only way to produce irons that will meet the tensile strength and machinability requirements that our customers need in special castings."

The furnace he mentioned, of course, was a Lectromelt*—and the results he mentioned are typical of the precise control that Lectromelt furnaces make possible, whether you're working with irons, semi-steels or alloy steels. Precise control at costs often comparable to cupola melting—and with unmatched flexibility.

Labor-saving, top-charging Lectromelt Furnaces make possible such precise control at low cost, whether you're melting or smelting, refining or reducing. Our engineers will gladly discuss means of cutting costs for these operations, without cutting quality. Write Pittsburgh Lectromelt Furnace Corporation, 316 32nd Street, Pittsburgh 30, Pa.

Pouring a "special" that's really routine; duplexing in this Lectromelt Furnace gives castings specified wear-, heat- and pressure-resistance.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa.



*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT... MOORE RAPID *Lectromelt*

WHY MOST FOUNDRIES USE SEACOAL, BENTONITE AND SAND STABILIZER FOR THE PREPARATION OF FACING SAND

Here are the reasons why an overwhelming majority of iron foundries, for many years, have found that molding sands prepared with seacoal, bentonite and sand stabilizer definitely can be relied upon for uniform, advantageous and thoroughly satisfactory results . . .

EASY TO USE—Because they are finely ground, dry materials, seacoal, bentonite and sand stabilizer are easy to handle, easy to add and mix with sand. Seacoal and bentonite are ground and screened in a variety of grades to suit the requirements of every type of work.

EASY SAND CONTROL—It's easy to control all of the important physical characteristics of molding sand with seacoal, bentonite and sand stabilizer. By adding the proper amount of seacoal, the carbon content can be controlled at will and changed to suit the job. Through the use of bentonite, the green and dry strength of the sand can be varied as required. The ad-mix of sand stabilizer provides control of flowability, so molds can be rammed to proper hardness. At the same time, it reduces the possibility of "buckles", "blows", "scabs", "swells", "cuts", etc., by fortifying the sand to insure proper expansion and contraction. The safe moisture range of the prepared sand is also broadened. Depending on the job to be made, moistures can safely be run higher, because sand stabilizer attracts considerable moisture to itself.

LOW COST SAND—It's not necessary to use a special grade sand or a fine mesh sand for this method of sand preparation. Any grain size may be used, so permeability is easy to control. And common lake sand may be added to the mixture as replacement.

BETTER CASTINGS—This type of sand preparation insures the production of good castings. Better casting finish is definitely obtained—pattern-true, free of surface imperfections and free of distortion.

BETTER SHAKEOUT—Cleaner, better and less-lumpy shakeouts are obtained with sand thus prepared. Sand adherence is greatly reduced, thereby minimizing the necessity for sand replacement to the heap or system.

LOWER COSTS—Seacoal is extremely low in cost. A prominent automotive production foundry determined that seacoal actually costs them only 25c per ton of castings produced. Bentonite and sand stabilizer, too, are inexpensive additives. Furthermore, low cost sand of proper grain size may be used for replacement, to keep costs to a minimum.

CROWN HILL SEACOAL ANALYSIS

Proximate
(Moisture Free)

Volatile Matter	38.9%
Fixed Carbon	57.4%
Ash	3.7%

Ultimate

Hydrogen	5.4%
Carbon	82.0%
Nitrogen	1.6%
Oxygen	6.6%
Sulphur	.7%
Ash	3.7%
Fusion Point	2780°F

CROWN HILL Seacoal, mined by FEDERAL at Crown Hill, West Virginia, is *high* in volatile combustible matter and *low* in sulphur and ash content—basic requirements for a top quality seacoal. Check the analysis of Crown Hill Seacoal shown at the left, prepared by the U. S. Bureau of Mines.

GREEN BOND Bentonite, produced and guaranteed by FEDERAL, is unexcelled in uniformity and ability to develop and control green and dry strength. It produces high green and dry strength in sharp sands even when comprising but ½% to ¾% of the entire mixture. Truly the best of the bentonites!

FEDERAL Sand Stabilizer is a processed cellulose sand additive, greatly superior to wood flour, cereal binders, iron oxides, etc. Its high combustibility allows sand to expand evenly to eliminate casting defects. It increases sand flowability, providing much better ramming conditions. And it attracts moisture to itself, to broaden the safe moisture range.

AND HERE'S WHY THEY PREFER CROWN HILL Seacoal, GREEN BOND Bentonite and FEDERAL Sand Stabilizer . . .

* * *

To learn how your foundry, too, can be assured of tailor-made sand for every job, plus easy control of the important physical characteristics of sand, at low cost—write us for informative bulletin on the use of Crown Hill Seacoal, Green Bond Bentonite and Federal Sand Stabilizer.

FEDERAL

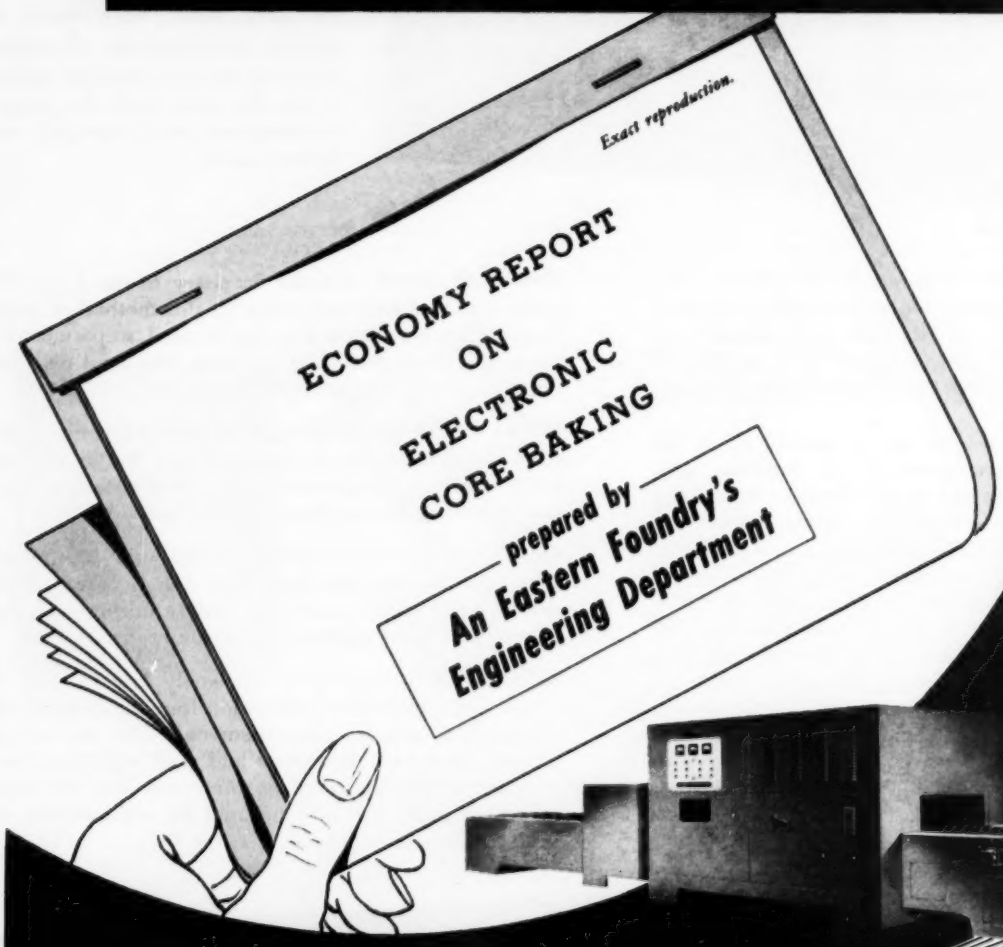
The FEDERAL FOUNDRY SUPPLY *Company*

4600 EAST 71st STREET, CLEVELAND 5, OHIO

CROWN HILL, W. VA. • CHICAGO • DETROIT • MILWAUKEE • RICHMOND, VA. • ST. LOUIS • CHATTANOOGA • NEW YORK • UPTON, WYO.

IN TWIN CITIES: Charles D. Gallaher, 11150 S. Old Shakopee Rd., Minneapolis 20, Minn.

THER-MONIC ...GETS TO THE CORE



— Report projects $37,605.00 annual core room savings from one electronic core baking unit!

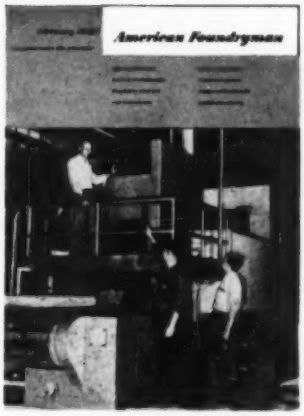
Detailed analysis submitted to management by this foundry's own engineering department resulted in the purchase of THER-MONIC equipment . . . a complete installation which will pay for itself within six months.

Your copy of this conclusive report . . . together with our new catalog will be forwarded upon request.

INDUCTION HEATING CORPORATION
181 WYTHE AVENUE • BROOKLYN 11, N. Y.
Largest Producers of Electronic Heat Treating Equipment

American Foundryman

February 1953 / *Volume 23 • Number 2*
Published by American Foundrymen's Society



Castings with a pedigree are made from the cores baked in this unique dielectric unit of Acme Aluminum Alloys, Inc., Dayton, Ohio. How this new equipment bakes huge cores on metal plates, not previously successfully done dielectrically, and how the cores are used to produce jet aircraft engine castings to exacting requirements are told in the story on page 36.

Publications Committee

H. J. Rowe, *Chairman*
Aluminum Co. of America, Pittsburgh
Harry W. Dietert
Harry W. Dietert Co., Detroit
C. H. Lorig
Battelle Memorial Institute
W. D. McMillan
International Harvester Co., Chicago
H. M. St. John
Crane Co., Chicago
F. J. Walls
International Nickel Co., Detroit

A.F.S. Headquarters

616 S. Michigan, Chicago 5
Wm. W. Maloney
Secretary-Treasurer
S. C. Massari, *Technical Director*

American Foundryman

H. F. Scoble, *Editor*
Terry Koeller, *Advertising Manager*
Helen Dudek, *Advertising Production*
LaVerne Lahn, *Circulation*

Advertising representatives

Central
R. E. Cleary, *Commercial & Savings Bank Bldg., Berea, Ohio*
Berea 4-7719

Midwestern
H. Thorpe Covington Co.
677 N. Michigan Ave., Chicago
Superior 7-8054

Eastern
Robert B. Weston, *550 Fifth Ave., New York, N. Y.*
Plaza 7-6454

Trends

35 The forgotten man
Our turn to take stock

Operations and methods

36 Modern foundry methods—Castings with a pedigree
Carl R. Loper / James D. Claffey / Frank L. Waldenmeyer
41 Faster melting, cleaner air with new cupola emission control equipment
48 Grain size of Hadfield's steel
S. L. Gertsman
51 Pro's and con's of necked down risers
J. B. Caine
55 Redesigned for malleable
62 Shop talk—practical questions and answers
65 Insulating an electric furnace roof
C. C. Spencer

Technology

57 Properties of synthetic sand
Mary T. Zemantowsky
69 Practical heat transfer
W. S. Pellini

In the news

39 1953 A.F.S. Convention program shapes up rapidly
44 Paris in '53: complete itineraries of European tours
49 S & H & AP contributions help expand safety training
79 Conference programs: Southeastern regional and Foundry Educational Foundation
84 Chapter news

Departments

7 *Here's how*
17 *Talk of the industry*
22 *Letters to the editor*
29 *Foundrymen in the news*
56 *Future meetings and exhibits*
62 *Now there's an idea*
63 *Rammed up and poured*
81 *Foundry tradenews*
83 *Abstracts*
103 *Products and processes*
104 *Free foundry information*
118 *Classified advertising*
119 *Advertiser's index*

Published monthly by the American Foundrymen's Society, Inc., 616 S. Michigan Ave., Chicago 5. Subscription price in the U.S., Canada, and Mexico $3.00 per year; elsewhere, $6.00. Single copies 50c. Entered as Second Class Matter, July 22, 1938, under Act of March 3, 1879, at the Post Office, Chicago.

PENN SAND

SILICA FLOUR

it makes sense . . . use the best AT NO EXTRA COST

The excellent refractoriness of PENN SAND Silica Flour reduces metal penetration, minimizes surface defects and produces castings of exceptionally smooth finish. In your mold wash, you will find that constantly uniform PENN SAND Silica Flour gives the same suspension and thickness of application every time; you always get the same even coating. ● Its high fusion point and perfect uniformity also make PENN SAND Silica Flour ideally suited as an admixture to your mold and core sands. Supplied by the country's leading producer of quality silica products, PENN SAND Silica Flour is available for immediate shipment to you in a complete range of grades. ● It makes sense to use the best silica flour when it costs no more. Write today for free samples—and on your next order be sure to specify PENN SAND Silica Flour, the most economical material for mold wash.

PENNSYLVANIA PULVERIZING COMPANY

subsidiary of PENNSYLVANIA GLASS SAND CORPORATION

producers of

MOLDING SAND • CORE SAND • SHELL-MOLDING SAND • SANDBLAST SAND

General Sales Offices: GATEWAY CENTER, PITTSBURGH, PA. • Eastern Sales Office: TRENTON TRUST BLDG., TRENTON, N. J.

NICKEL ALLOY IRONS
develop improved properties
plus all the basic advantages of plain cast iron

PLAIN GRAY IRON is, structurally, a steel matrix containing graphite flakes. Engineering, physical, processing and service properties are wholly dependent upon the character and disposition of these flakes, and upon the nature of the matrix.

The matrix of nickel alloyed irons closely resembles the pearlitic matrix found in high carbon steels, whereas the matrix of ordinary plain iron resembles that found in low carbon steels. Compositions of nickel alloy irons can be adjusted to reduce "chill" in thin sections without risk of forming "spongy" regions in heavy sections. This promotes uniform strength, improved machinability, pressure tightness and wear resistance.

Hardness in nickel cast irons results from improvement of the matrix. Chilled areas and hard carbides, which impair machinability, are obviated. Nickel improves response to heat treating. In fact, use of nickel alone or with other alloying elements plays an important part in meeting a variety of requirements.

Accordingly . . . nickel alloyed irons permit production of castings with high levels of the following properties:

Strength

Tensile and transverse strengths of castings are greatly increased by the addition of nickel to cast irons of properly adjusted base mixture. The ratio of compressive strength to tensile strength is retained. Greater uniformity of strength in thick and thin sections is achieved.

Elasticity

The elastic modulus increases with strength. In this respect nickel-containing irons of the high strength type possess good stiffness and do not deform permanently under loads that would be damaging to irons of lower elastic modulus.

Damping Capacity

The damping capacity inherent in gray cast iron is not impaired by the presence of nickel.

Wear Resistance

The uniformly pearlitic matrix of nickel cast irons appreciably improves wear resistance. The uniformly fine graphite flake distribution, achieved in suitably processed irons *without formation of a poor wearing dendritic condition*, affords optimum resistance to wear and galling.

Pressure Tightness

Characterized by dense grain structure and fine dispersion of graphite throughout, nickel alloy irons are close-grained and offer an extraordinary degree of pressure tightness under high hydrostatic pressures, without sacrificing machinability.

Applications

Heavy machinery frames and *beds* are typical of cast parts that benefit from the rigidity and good damping capacity of nickel cast irons. *Cylinder* and *pump liners, gears, dies, machine tool ways, saddles* and *tables* exemplify parts produced in nickel irons to assure greatly increased strength and wear resistance. And nickel alloyed iron is used for *heavy duty brake drums* to resist heat checking, thermal shock, wear and galling. The nickel cast irons are readily heat treated, and respond particularly well to flame and induction hardening.

At the present time, the bulk of the nickel produced is being diverted to defense. Through application to the appropriate authorities, nickel is obtainable for the production of engineering nickel cast irons for many end uses in defense and defense supporting industries.

The International Nickel Company, Inc.
Dept. AF, 67 Wall St., New York 5, N. Y.

Please send me booklet entitled, "Guide to the Selection of Engineering Cast Irons."

*Name*_____ *Title*_____

*Company*_____

*Address*_____

*City*_____ *State*_____

EMBLEM OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

TASIL gives you more heats per day more tons per lining

FOR EXAMPLE:

The modern, streamlined foundry of the H. B. Salter Mfg. Co., Marysville, Ohio, operates this battery of 350 lb. Type "LFC" Detroit Electric Furnaces which are maintained with Taylor Sillimanite (TASIL) Linings, Patches and Cements.

These furnaces melt plumbing brass and average 12 to 15 heats of 440 lbs. each in 9 hours. Lining life averages between 750,000 to 1,000,000 lbs. of metal, with minimum patching. Are your furnace linings producing results like this?

OUTER LININGS

TASIL Hydrocast, the castable refractory for use at temperatures up to 3000° F., is now being used to form outer linings for 350 lb. "LFC," 500 lb. "LFN," and 700 lb. "LFY" Detroit Electric Furnaces, replacing insulating fire brick shapes. Experience to date shows Hydrocast to be more economical; easier and faster to install. Your Taylor representative will give you complete details.

Exclusive Agents in Canada:
REFRACTORIES ENGINEERING AND SUPPLIES, LTD.
Hamilton and Montreal

The CHAS. TAYLOR SONS Co.
A SUBSIDIARY OF NATIONAL LEAD COMPANY
REFRACTORIES SINCE 1864 • CINCINNATI • OHIO • U.S.A.

here's how

Here's how Electric Steel Castings Co., Indianapolis, Ind., reduced overall cleaning costs of heavy steel castings 50 per cent. 200 tons of castings per month, some of them weighing 3,000 lb, are cleaned in a Swing Table Cabinet manufactured by American Wheelabrator & Equipment Corp. Cleaned after shakeout and after annealing, the total throughput is 400 tons per month. Average cleaning time in this airless blast cabinet is 5 minutes for green castings, 2 minutes for annealed. Improved surface cleanliness has increased grinding wheel life and speeded inspection.

For more data circle No. 1 on card, page 103.

here's how . . . here's how . . . here's how . . . here's how . . . here's how . . . here's how . . . here's how . . .

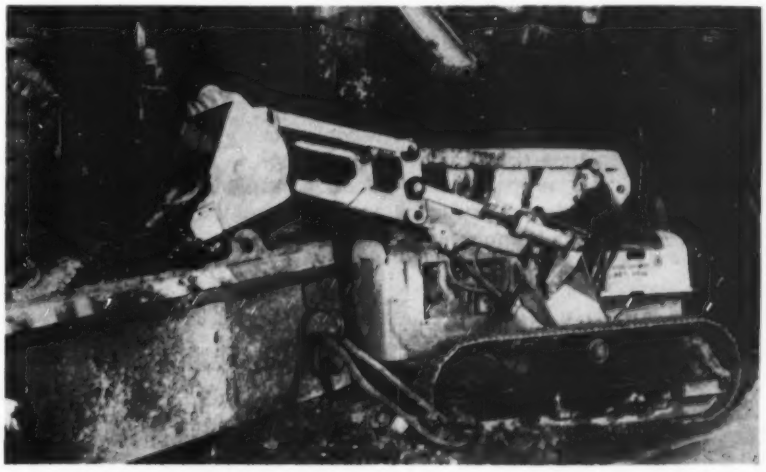
Here's how J. C. Heintz Co. of Cleveland makes plaster cores for aluminum tire molds. The plaster used is U. S. Gypsum's Hydroperm which, when stirred with a rubber disk instead of the conventional propeller, becomes a homogenized mass of plaster and water and finely divided air bubbles. The wet plaster core sections set in 15 to 20 minutes and are then dried in recirculating type core oven. Permeability of Hydroperm is 25 to 40 as compared to approximately 1 for conventional metal casting plaster.

For more data circle No. 2 on card, page 103.

here's how . . . here's how . . . here's how . . . here's how . . . here's how . . . here's how . . . here's how . . .

Here's how a large captive foundry uses an Allis-Chalmers HD-5 diesel-powered crawler tractor with Tracto-Shovel to clean up around a cupola. Foundries also use this equipment for handling sand inside the shop, handling scrap, unloading sand from box cars, moving sand from storage piles to elevating loaders and conveyor belts, and removing snow from plant yards and parking lots, sidewalks, and streets.

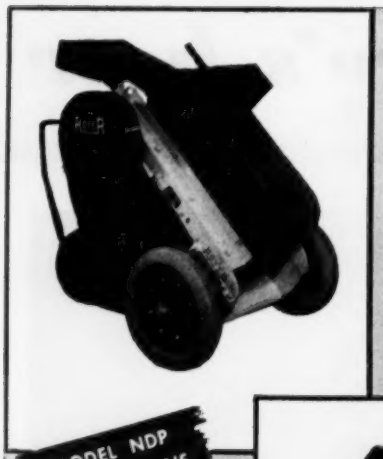
For more data circle No. 3 on card, page 103.



Turn to page 101 for more equipment and materials that solve production problems.

Sand Conditioning

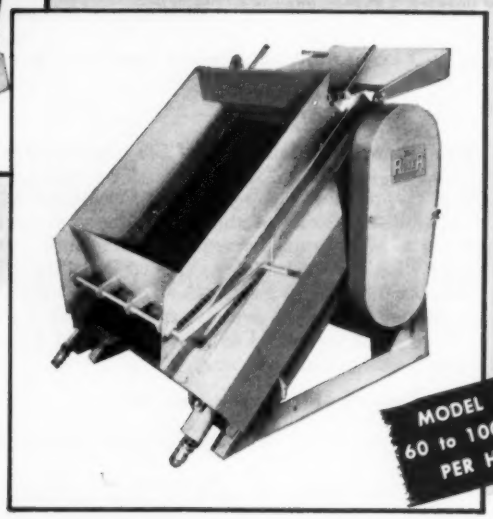
for medium to large foundries



MODEL NDP
20 to 25 TONS
PER HOUR

MODEL NRS
40 to 50 TONS
PER HOUR

A ROYER CAN SUPPLY THE TONNAGES YOU REQUIRE



MODEL NYS
60 to 100 TONS
PER HOUR

A Royer Sand Separator and Blender provides rapid, efficient sand preparation, in tonnages to meet most any requirement. More than 8,000 of these cost-cutting units are at work in foundries, conditioning molding sand for jobbing and production work.

Sand is fed into the hopper and the "combing belt" action does the rest . . . rapidly and automatically. Conditioned sand is discharged after being thoroughly mixed, blended and aerated, with all trash removed.

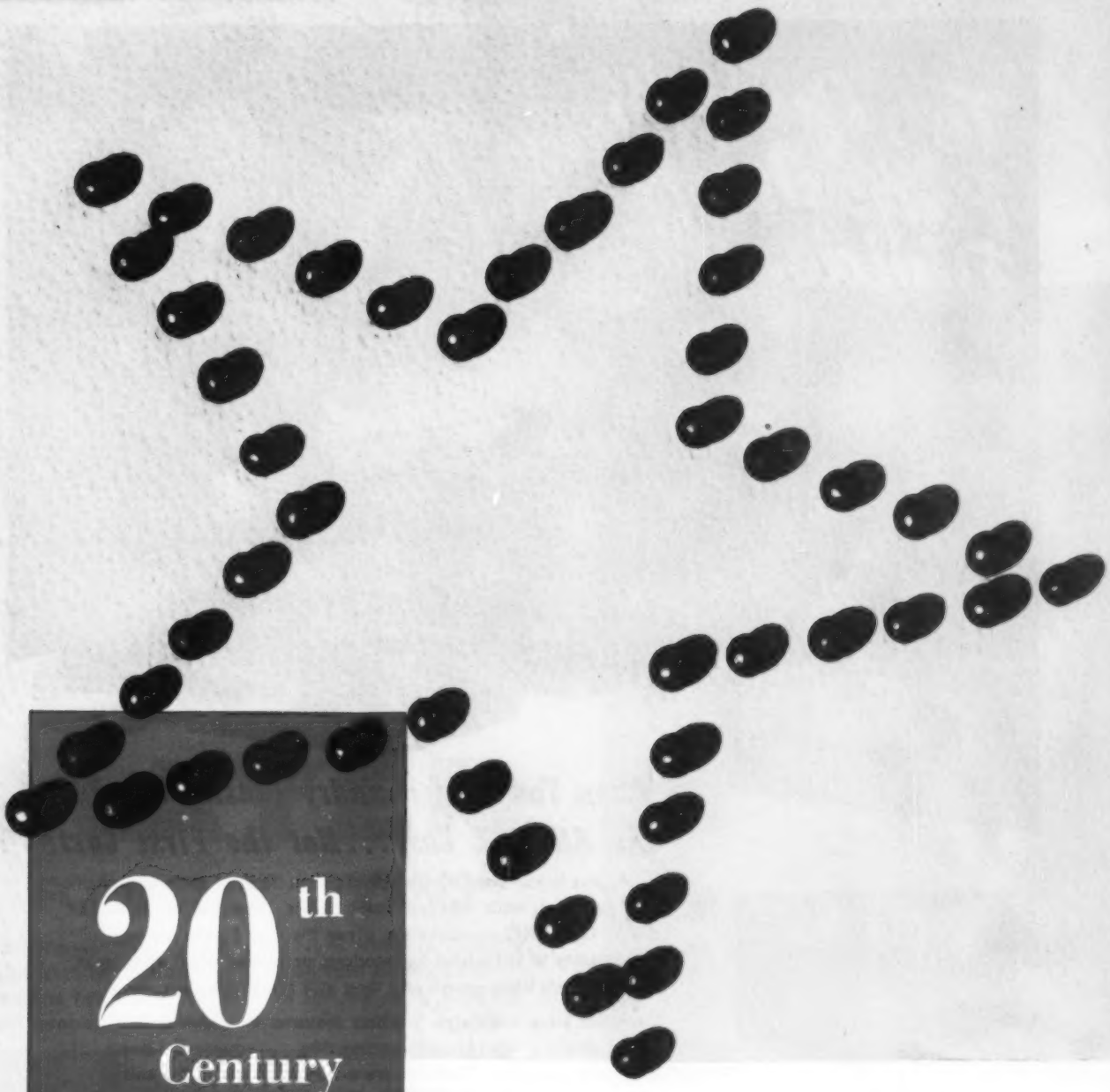
In addition to the saving in labor costs over slow, time consuming manual preparation, this properly conditioned sand aids in securing many additional economies. New sand requirements are lowered . . . the smoother surfaced castings require less machining and grinding . . . rejects due to scabs, skids and runouts are greatly reduced.

More than half of the Royer users have purchased additional units . . . real proof of their profitable and efficient performance. Send for bulletin giving information on all models in capacities from 4 to 100 tons per hour.

EXPORT DEPARTMENT
306 W. Washington Blvd.
Chicago 6, Ill., U.S.A.
Cable: ASMAN

Foremost in Sand ROYER *Conditioning Equipment*

ROYER FOUNDRY & MACHINE CO. 155 PRINGLE ST. KINGSTON, PA.



20th Century
the persuasive abrasive

Looking for a Star Performer?

20th Century* Normalized shot and grit will guarantee you top performance on four scores:

(1) Uniformity
(2) Toughness
(3) Economy
(4) Quality

A malleable abrasive, it's being used in foundries and metalworking plants everywhere.

Our new catalog is yours for the askina.

*Copyrighted Trade Name

THE CLEVELAND Metal Abrasive CO.

801 East 67th Street Cleveland 8, Ohio
Howell Works: Howell, Michigan

One of the world's largest producers of quality shot, grit and powder —Normalized—Hard Iron—Cut Wire

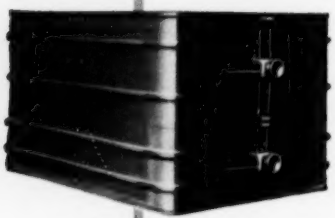
Top Quality Pays Off in Dividends

When You Buy Foundry Flasks, Consider the ANNUAL Cost... Not the First Cost!

You want to cut your casting production costs to rock bottom. You can do it with Sterling Steel Flasks. The famous ROLLED STEEL CHANNEL construction gives Sterling Flasks strength and rigidity to withstand tremendous pressures, year after year. You can treat them rough and they still retain their accuracy.

Consider such exclusive Sterling features as all-welded rolled steel . . . sturdy, reinforcing ribs . . . square flanges . . . full-width bearing. They insure a longer service life and greatly reduce the ANNUAL cost of flasks.

Actually, the so-called cheap flasks may be costly in the long run. So play safe. Buy Sterling Steel Flasks. They last longer . . . produce better castings . . . cost less per year. You'll find that top quality pays off in dividends.



Style ½ ND-RT Cope
Style ½ NS-RT Drag
Heavy Duty Flask.

Style ½ ND-RTX Cope
Style ½ NS-RT Drag
with Heavy Duty Clamps.

STERLING WHEELBARROW COMPANY
MILWAUKEE 14, WISCONSIN, U.S.A.

Sterling

Pioneers in the Manufacture of Foundry Flasks

A 6027-1PC

Aluminum Co. of America
American Brake Shoe Co.
American Radiator Co.
Blaw-Knox Co.
Brown Industries
Buick Motor Div. of General Motors Corp.
Bucyrus-Erie Co.
Cadillac Motor Div. of General Motors Corp.
Columbia Steel Corp. (U. S. Steel Corp.)
Crucible Steel Castings Co.
Dunkirk Radiator Co.
Eclipse Aviation Division of Bendix Aviation Corp.
Electric Autolite Co.
Ford Motor Co.
Fremont Foundry Co.
G. & C. Foundry Co.
General Electric Co.
General Motors Corp. and Subsidiaries
Gilbert & Barker Co.
General Steel Castings Co.
Golden Foundry Co., Inc.
Henry Kaiser Corp.
W. O. Larson Foundry Co.
Mesta Machine Co.
F. E. Meyers & Bro. Co.
Oil Well Supply Co. (U. S. Steel Corp.)
Packard Motor Car Co.
Pittsburgh Steel Foundry Corp.
H. B. Salter Co.
Shenango Penn Mold Co.
Standard Foundry Co.
Union Brass & Metal Mfg. Co.
Union Steel Castings Co.
West Michigan Steel Castings Co.
A. C. Williams Co.
Whiten Machine Works
Whiting Corp.

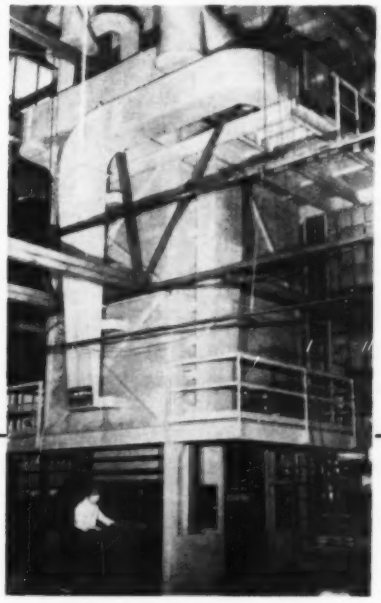
Outstanding Concerns

WITH MANY IMPRESSIVE INSTALLATIONS OF

CARL-MAYER

FOUNDRY OVENS

Carl-Mayer Core and Mold Ovens impress leading foundries with their many important developments. Designs have originated here for the most efficient and economical performance.

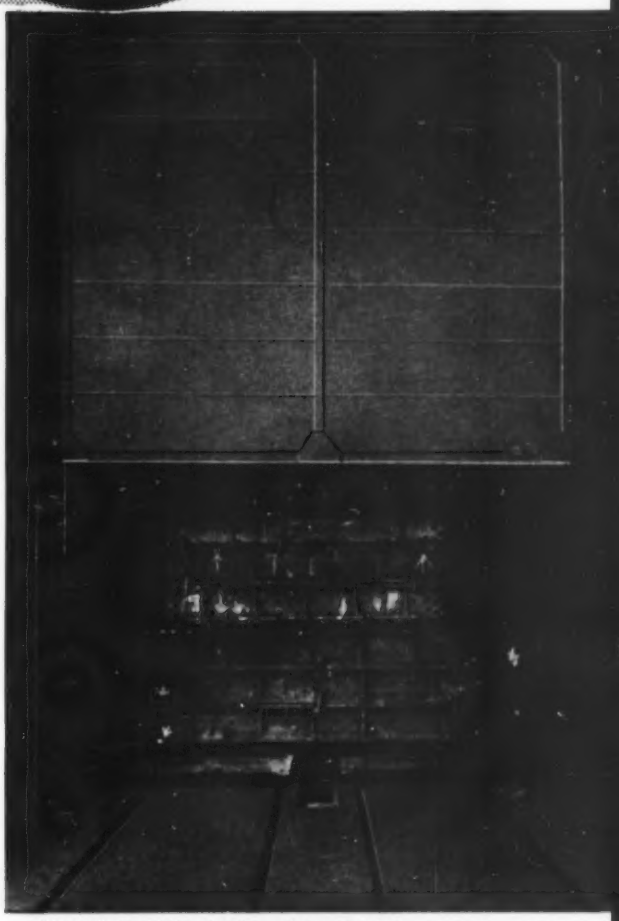


CARL-MAYER VERTICAL CORE OVENS at G. & C. Foundry Company.

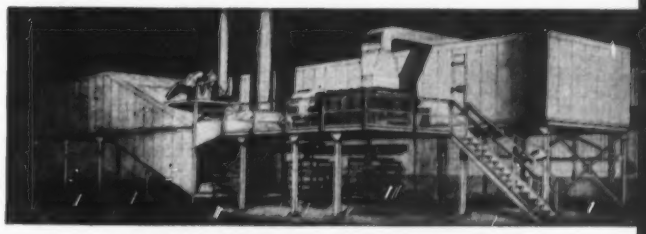
Carl-Mayer Ovens are famous for their rugged construction, too. It contributes greatly to prolonged foundry service.

May we figure on your next requirements?

WRITE FOR NEW BULLETIN NO. 53-CM



CARL-MAYER MOLD OVEN at Union Steel Castings Div. of Blaw-Knox Co. Door Clearance: 17' wide, 15' high. Depth: 40'. Capacity: 200 tons per bake. Combination Gas-Oil Fired. Patent applied for.



CARL-MAYER HORIZONTAL MONORAIL CORE OVEN at Eclipse Aviation Co. Patent No. 2355814.

THE CARL-MAYER CORP.

3030 Euclid Ave., Cleveland, Ohio

CORE AND MOLD OVENS, ALL SIZES. ALSO OTHER TYPES OF INDUSTRIAL OVENS, FURNACES.

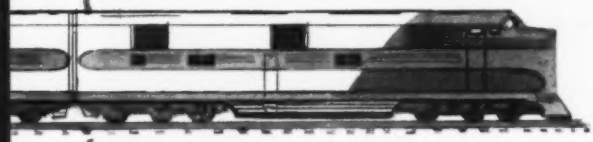
Backed by over 30 years' experience

There goes our 400th SIMPSON *Porto-Muller*®

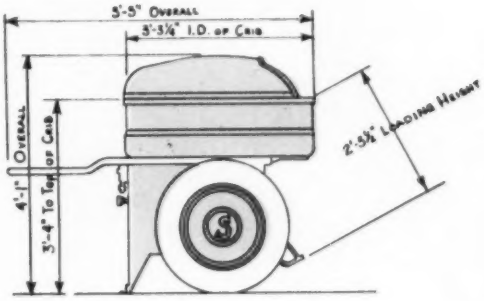
The low cost Simpson Porto-Muller was first introduced in April, 1949. Since that time, we have built *four hundred* of these versatile mixers, and have shipped them to foundries in every part of the country.

The ever-increasing use and acceptance of the Porto-Muller is a real testimonial to its value in providing experienced foundrymen with a fully portable and practical mixer for all types of foundry sand . . . from the slickest core sand mix to the toughest steel sand facing.

Check over the outstanding Porto-Muller features and proof of acceptance on the opposite page—and then have a National Engineer show you how this versatile muller can increase production and casting quality at lower cost.



here are a few reasons for the *Porto-Muller's* popularity:



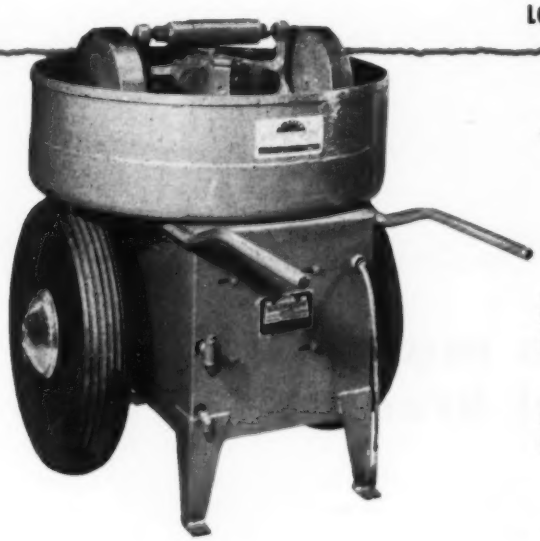
100% PORTABLE . . . *Completely self-contained — no auxiliary hoists or ceiling supports needed.*

BIG CAPACITY . . . . *Easily handles 250 to 300 lbs. of sand.*

READY TO GO . . . *Fully equipped with dust hood, motor starter, electric cable — plug into outlet and you're mulling.*

ADJUSTABLE MULLERS . . . *Spring adjustment pre-loads mullers within a range of 100 to 275 lbs., to provide correct muller weight for all types of sand.*

LOW COST — PROMPT DELIVERY



. . . and here's what typical *Porto-Muller* users have to say . . .

"reduced our casting losses with sand prepared by this machine . . . have increased production and produced smoother castings"
(Gray Iron Foundry, Pennsylvania)

"saving at least 50% on labor and 25% to 50% on core oil . . . getting smooth and better cores"
(Brass Foundry, Michigan)

"saving about 50% of labor cost . . . also reduced binder about 50%"
(Iron Manufacturer, Kansas)

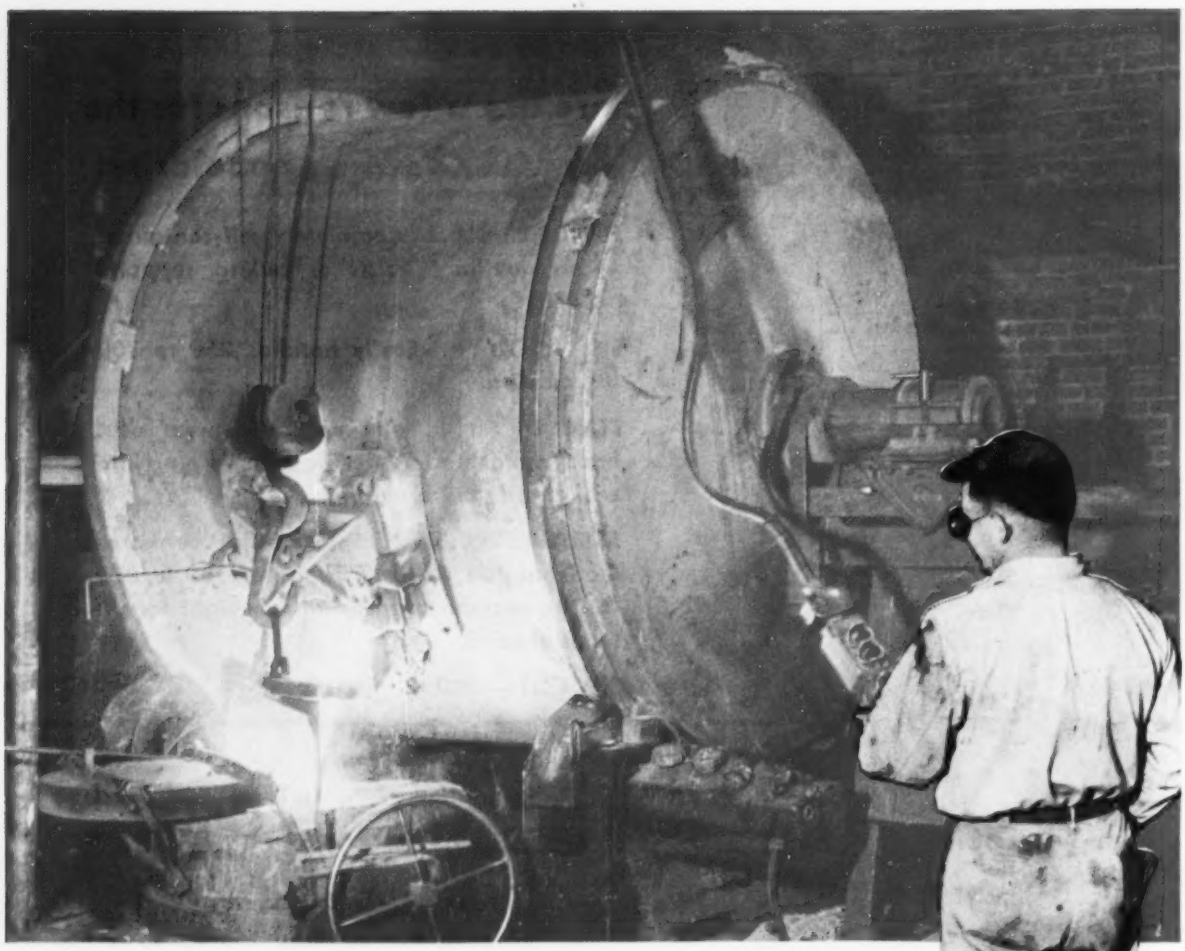
"previously took 4 man-hours to mix 5 wheelbarrows of sand — with Porto-Muller, now takes one man 45 minutes . . . also use about ½ the amount of oil and water, with better results"
(Bronze and Aluminum Foundry, Illinois)

Write for Bulletin 492

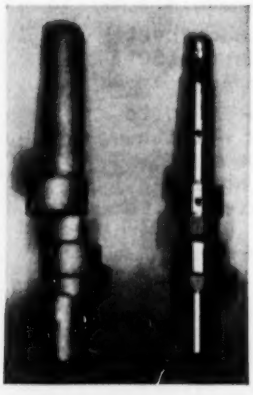
National Engineering Company
(Ohio Inc.)
600 Machinery Mall Bldg. — Chicago 6, Illinois

SIMPSON *Intensive* **MIX-MULLERS**

Manufacturers and Selling Agents: For Continental European Countries — George Fisher, Ltd., Schaffhausen, Switzerland; for British Possessions — August's Limited, Halifax, England; for Canada — Dominion Engineering Co., Ltd., Montreal; for Australia and New Zealand — Gibson, Battle & Co., Pty., Ltd., Sydney, for Argentina, Brazil and Uruguay — Equipamentos Industriais EISA Ltda., Sao Paulo, Brazil; for Mexico — CASCO ,S. De R.L., Mexico, D.F.



This furnace helps make ice cubes and cool breezes



Raw casting and finished crankshaft of York hermetic compressor. Cast from metal melted in Detroit furnace.

TWO Detroit Rocking Electric Furnaces produce the iron alloys for castings used by York Corporation in their ice-making and air conditioning equipment. The furnace illustrated has an 8000 lb. capacity; the other's capacity is 2000 lbs.

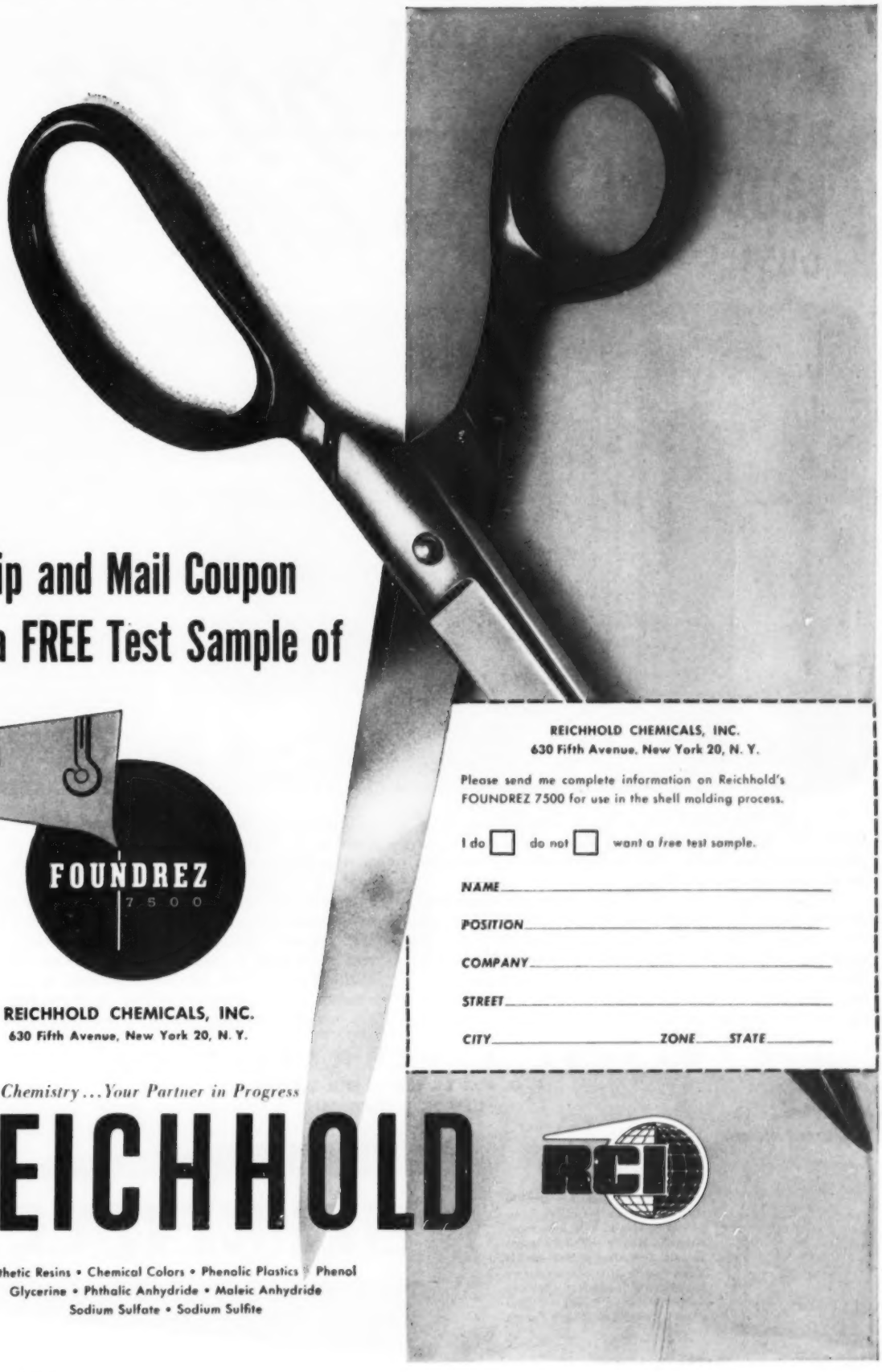
In the York foundry, Detroit Rocking Electric Furnaces were chosen to meet the requirements for high quality heats produced with speed and economy. Rocking action of the furnaces makes full use of heat from the indirect arc, and guarantees a homogeneous melt. Better metal means better castings, fewer rejects, lower cost.

Investigate Detroit Rocking Electric Furnaces for your needs. For ferrous and nonferrous metals. Capacities from 10 to 8000 lbs. Each installation is engineered to fit *your* particular requirement, solve *your* problem.

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sau Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.



Clip and Mail Coupon for a FREE Test Sample of

FOUNDREZ 7500

REICHHOLD CHEMICALS, INC.
630 Fifth Avenue, New York 20, N. Y.

Creative Chemistry ... Your Partner in Progress

REICHHOLD

RCI

Synthetic Resins • Chemical Colors • Phenolic Plastics • Phenol
Glycerine • Phthalic Anhydride • Maleic Anhydride
Sodium Sulfate • Sodium Sulfite

REICHHOLD CHEMICALS, INC.
630 Fifth Avenue, New York 20, N. Y.

Please send me complete information on Reichhold's FOUNDREZ 7500 for use in the shell molding process.

I do ☐ do not ☐ want a free test sample.

NAME_____

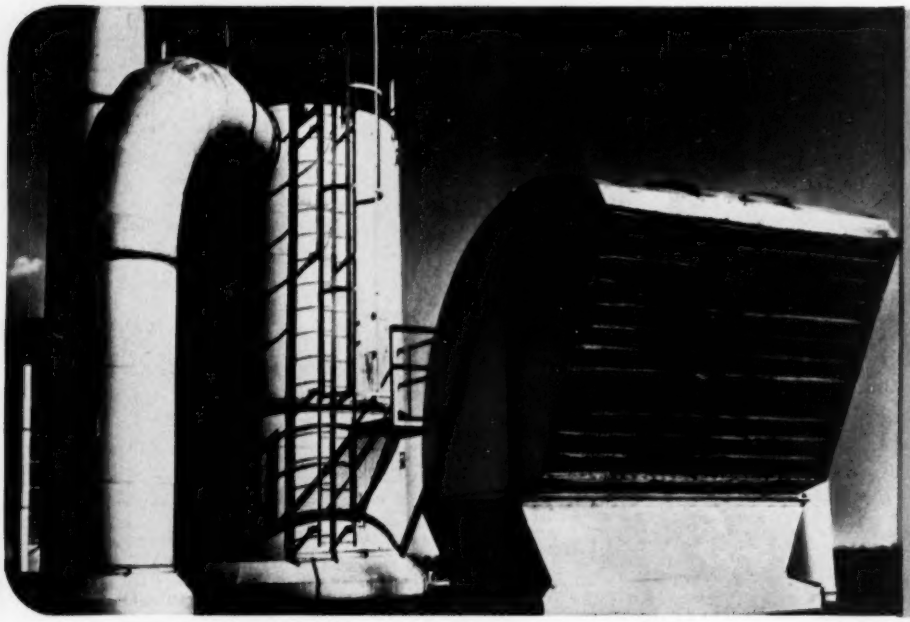
POSITION_____

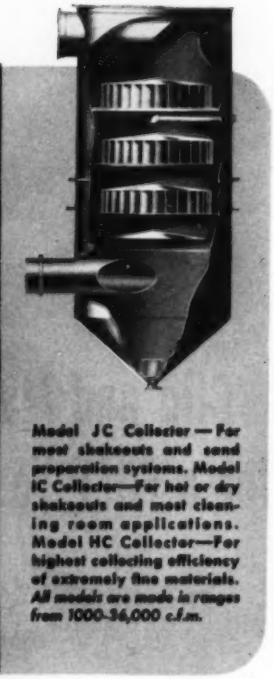
COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

INDEPENDENT LABORATORY TESTS FIND MULTI-WASH DUST COLLECTOR SYSTEM 99.9% *Efficient*





Model JC Collector — For most shakeouts and sand preparation systems. Model IC Collector—For hot or dry shakeouts and most cleaning room applications. Model HC Collector—For highest collecting efficiency of extremely fine materials. *All models are made in ranges from 1000-36,000 c.f.m.*

A recent Schneible Multi-Wash installation in a nationally known foundry, has been job-tested by a prominent laboratory. The findings—99.9% efficient on overall normal operation.

This test was conducted to determine the efficiency of dust removal by weight and by count in four particle size ranges, 15 to 30 microns, 5 to 15 microns, 2 to 5 microns and under 2 microns with a type IC Multi-Wash Collector having 4½ impingement stages. During sampling it was handling 33,620 c.f.m. under normal foundry production.

These tests, based on a number of dust particles, showed an efficiency of 99.9%. Based on weight efficiency the percentage was even higher. The chemical analysis was based on dehydrated samples which were so small on the amount remaining from the discharge, that actual silica or other analysis could not be made.

If you are considering any dust collecting system, you can't find a more highly efficient system than Multi-Wash. *Write for your free copy of the complete analysis of the above installation* and *see how you, too, can benefit with Multi-Wash.*

CLAUDE B. SCHNEIBLE CO.

P. O. BOX 81, NORTH END STATION
DETROIT 2, MICHIGAN

Free

Write for your copy today

PRODUCTS:

Multi-Wash Collectors • Uni-Flo Standard Hoods • Uni-Flo Compensating Hoods • Uni-Flo Fractionating Hoods • Water Curtain Cupola Collectors • Ductwork • Velocitrap • Dust Separators • Entrainment Separators • Settling and Dewatering Tanks • "Wear Proof" Centrifugal Slurry Pumps

SCHNEIBLE

talk of the industry

SHELL MOLDING PATENTS and patent applications owned by Polygram Casting Co., Ltd., are listed in a recent issue of Foundry Trade Journal along with a statement of the company's position issued by Lord Trefgarne, chairman of the directors. The statement says in part: "Although the original conception was that of Herr Croning, it is only since the war that methods, especially methods of mechanization, have been developed to the stage of commercial application. Polygram is able to state that their patent position, being based on new features, constitutes...a strong positive patent position....In the United Kingdom and in certain other countries, the Polygram patent position is much stronger than in the U. S....The sum of these new developments build up into what may fairly be called a distinctive technique--known throughout the world as the Polygram Shell-molding Process." Patents and patent applications totaling 41 date from January 1947.

$2,000,000 FOUNDRY has been authorized by National Malleable & Steel Casting Co., to be built by the company's subsidiary, Capitol Foundry Co., near Phoenix, Ariz. New plant will be located on same site where Capitol is presently building a cast steel grinding ball foundry. Main output of the new plant will be castings for the mining industry.

TERMS AND CONDITIONS OF SALE have been studied jointly for the past two years by Non-Ferrous Founders' Society and National Association of Purchasing Agents and a set of standard business practices adopted. Nineteen terms and conditions are listed in the agreement.

METALS ARE ALMOST STATIC, with slight easing among ferro-alloys, according to Issue No. 10 of DPA's "List of Basic Materials and Alternates." Bentonite, which has been in Group III (in fair to good supply) has been removed along with other materials considered in ample supply with no threat of shortage. Heavy castings (over 3,000 lb gray iron, alloy iron, carbon steel, low and high alloy steel) are in Group I (short supply). Castings in Group II (in approximate balance between supply and demand) are carbon and low alloy steel under 3,000 lb. Lightweight alloy iron, light and intermediate gray iron and malleable iron are listed in Group III.

DRAFT BOARDS aren't able to make deferments intelligently unless they know what a worker or apprentice does and how long it takes to teach his replacement. Foundrymen and patternmakers in danger of losing men will be interested in what the Pattern Manufacturers' Group of Cleveland did about it. Last year they conducted local draft boards through Motor Pattern Co. shops to see what patterns are, how they are made, who makes them. Afterward the draft boards were taken to dinner where patternmakers continued the educational process.

BUSINESS PREDICTIONS FOR 1953 by most observers seem to follow essentially the same pattern. Consensus: 1953 will be about the same as 1952. Foundry Equipment Manufacturers' Association opinion, based on an annual survey of members, is that foundry business will be the same as the 1952 average; a few thought business would be worse. Department of Commerce survey reports American business expects to invest about the same amount in plant and equipment in 1953

($26.3 billion) as it invested in 1951 and 1952, both record years. Machinery & Allied Products Institute outlook is for business to be very active the first half, with the crystal ball cloudy the last half. Consensus of MAPI: Overall business conditions about the same as in 1952.

PRICE CONTROLS ARE LOOSENING as the need for relief is demonstrated by the foundry industry. In addition to the earlier 6.2 per cent increases granted the malleable industry by OPS, gray iron got a 9 per cent price rise allowance, steel (carbon, low alloy, manganese) got 5 per cent. The new orders on gray iron and steel (Sup. Reg. 2 and 3 and Amend. 8, CPR60) became effective January 2. On January 23, Sup. Reg. 4 authorized producers of high alloy steel castings to raise ceiling prices 3½ per cent. OPS is now studying non-ferrous castings, and cast iron boilers and radiators. Although increases have been granted and are justified, some foundrymen are reluctant to take advantage of them because the law of supply and demand continues to control.

TAPERING OFF OTHER CONTROLS is indicated by changes in NPA. In October, the chief of the department job was abolished and George P. Fisher was named acting chief of the foundry equipment division. On December 20 he was released, as were most other industry members, but will be available for future duties and may spend some time in Washington each month.

GREATEST UNDEVELOPED SOURCE of power is the human mind, according to Hiram Brown, chief metallurgist, Solar Aircraft Co., Des Moines, Iowa, in telling the Iowa Industrial Training Association how to alleviate the shortage of engineers. His four-stage attack on the problem--which the foundry along with all industry faces--is: 1) Plan training which will develop the natural abilities of engineers available; 2) make recommendations to management which will assure that the men will be used effectively and efficiently; 3) outline training programs to prepare for the upgrading of men with ability but with less formal training; 4) encourage young people to study engineering.

METAL TRENDS, American Brake Shoe's new company publication (first issue, November) is notable for its sales approach. Purpose is to acquaint customers and prospects with all ten divisions of Brake Shoe, through case histories and technical information about all company products. The information is handled in an easy-to-read news style and is illustrated with products and operations of Brake Shoe.

REDUCTION OF DUST has been achieved with an improved hood and work rest design developed by the British Steel Founders' Association. The new device, easily fitted to existing machines and new equipment, is effective with high (9,000 fpm) and medium (5,400 fpm) peripheral velocity wheels. A film illustrating development and use of the improved hood for pedestal grinders will be shown at the 1953 annual conference of the Institute of British Foundrymen. Features of the new dust control are: slotted or perforated work rest; minimum gap between casing and wheel; adjustable "gap-closer" at point where wheel emerges from cowling immediately in front of operator's face; suction at work rest to prevent dust following wheel around and out into workman's face.

Link-Belt equipment at Cutler-Hammer foundry includes shakeout screen, bucket elevator, storage bin with vibrating screen (right); transfer belt conveyor, Revivifier and distributing belt conveyor (left).

LINK-BELT mechanization
pays dividends for foundries of all sizes

Here's how one important foundry gets fast, clean, low-cost handling of sand and castings

WHETHER your foundry is large or small, mechanized handling of sand and castings offers two big advantages. First, you can produce better castings at lower cost. Equally important, you can make more efficient use of scarce manpower . . . eliminate much backbreak, improve working conditions.

For instance, consider Cutler-Hammer, Inc., Milwaukee. Their new Link-Belt-designed system prepares 15 tons of sand per hour for two stack molding machines. Careful planning has speeded production, provides good housekeeping. Central shakeout simplifies handling and sorting of castings. Despite low headroom, alterations were minor. And provision has been made for expansion.

For information on how mechanization can serve you, call the Link-Belt office near you. A Link-Belt foundry specialist will welcome the opportunity to work with you or your consultant.

Link-Belt Shakeout gives positive separation of sand and castings.

Ram-offs are minimized because sand is thoroughly aerated for easy flowing by Link-Belt Revivifier.

LINK-BELT

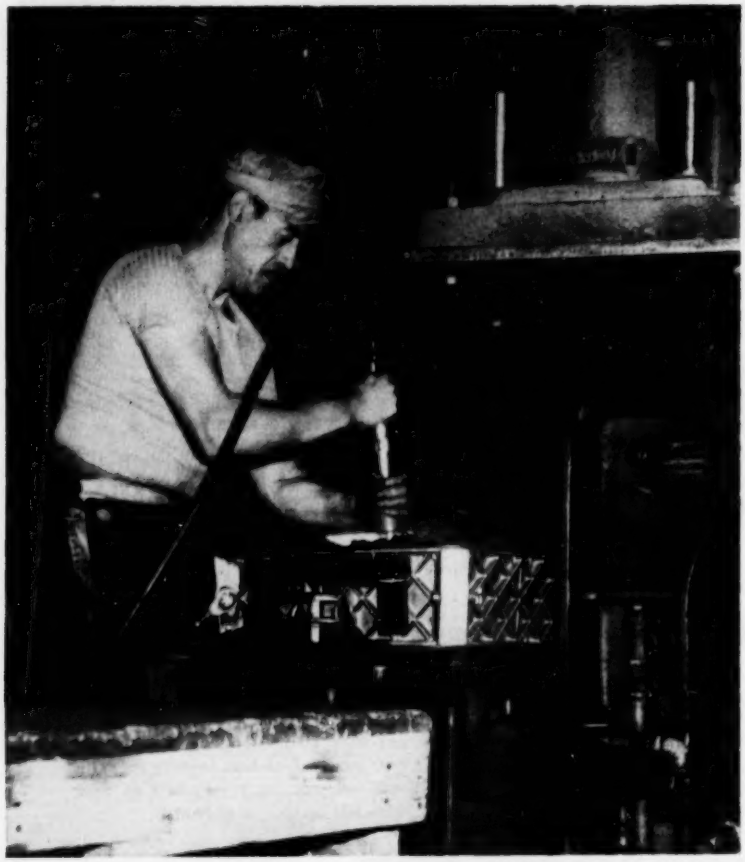
Conveyors and Preparation Machinery

■

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 12,750

MEMBER FEMA

HOW THIS FOUNDRY GOT SIX PERCENT MORE OUTPUT WITH CLECO BENCH RAMMERS



A large western foundry has six mechanized lines making small castings. They were using hand rammers on all the lines but they decided to make a comparison using Cleco "OB" Bench Rammers. Here's what they found:

1. Cleco Rammers cut ramming time about 35 percent.

2. Production of lines using Cleco Rammers was about *six percent above* the lines where hand rammers were used.

3. Uniformity of castings was improved. There was less swelling, fewer rejects and less clean-up time.

4. Operator fatigue was reduced.

This is just one example of how Cleco Rammers can increase production and reduce costs. Have a Cleco Field Engineer go over your ramming problems with you. Maybe you can increase your output, too.

CLECO AIR TOOLS

PNEUMATIC DALLETT ACCESSORIES

CLECO DIVISION

of the REED ROLLER BIT COMPANY, 5125 Clinton Drive, Houston 20, Texas, U.S.A.

DIVISION OFFICES

CALIFORNIA: Los Angeles, 1317 Esperanza St. • **GEORGIA:** Atlanta 3, 502 Peters Building • **ILLINOIS:** Chicago, 5701 West Madison St.
MICHIGAN: Detroit, 18071 Wyoming Avenue • **MISSOURI:** St. Louis 3, 2322 Locust Street • **NEW JERSEY:** Newark 4, 75 Lock Street
PENNSYLVANIA: Philadelphia 20, 5220 N. Fifth St. . . . Pittsburgh, Room 621, Highland Bldg.

In Canada: Cleco Pneumatic Tool Company of Canada, Ltd., 927 Millwood Road, Toronto (Leaside), Ontario
DISTRIBUTORS IN PRINCIPAL CITIES OF THE UNITED STATES AND THROUGHOUT THE WORLD

THIS IS THE FORTIETH MOLD . . .

from one application of

STEVENS LIQUID PARTING

That's normal experience in a large Midwest foundry that averages 1200 tons of castings per month. They use Stevens Liquid Parting for all of their molding operations. Here's why:

- Stevens Liquid Parting gives up to 60 molds from one application.
- Patterns are left clean, with no adhering sand.
- Molders save time . . . increase production with each mold because they do not have to shake parting on the patterns each time.
- Molds always give smooth castings since sand separates cleanly.

Stevens Liquid Parting can be the answer to your molding problems. Why don't you try Stevens Liquid Parting?

Write for a sample – or call your Stevens representative today.

STEVENS

EVERYTHING FOR A FOUNDRY

OFFICES: **DETROIT • BUFFALO • CHICAGO • CLEVELAND • NEW HAVEN • INDIANAPOLIS**
IN CANADA: **FREDERIC B. STEVENS OF CANADA, LTD., TORONTO • WINDSOR**

Letters to the editor

All letters of broad interest which do not violate A.F.S. policy or good taste are publishable. Write to Editor, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Letters must be signed but will be published anonymously on request.

Story gives wide publicity

We have had a chance to thoroughly digest your December issue of AMERICAN FOUNDRYMAN, and certainly want to compliment you on the splendid way that you presented the results of our 1952 Redesign Contest Awards. As you know, a tremendous amount of staff and committee work goes into this annual contest, and it is only right that the findings of our committees should be widely publicized for the benefit of all gray iron foundrymen. We hope we will have equally good material ready for you for publication about the same time this fall.

DONALD H. WORKMAN, *Exec. V. P.*
Gray Iron Founders' Society
Cleveland

Reference linseed oil

As you have correctly stated in the December issue of AMERICAN FOUNDRYMAN (page 100), there is no approved specification for raw linseed oil for use in core oils. However, there is an A.F.S. Reference Linseed Oil processed from specially selected flax under extremely closely controlled conditions. Its specifications are:

Specific Gravity	0.931-0.935
Saponification Value	190-194
Iodine No. (Wijs)	178-182
Acid No.	2-4
Color (Gardner)	5 max.
Viscosity (Gardner-Holdt)	A_1-A
Moisture	0.1% max.
Ash	0.01% max.

This binder is not intended to be used as a standard for comparisons with core oils. When used (1 per cent) with A.F.S. Standard Testing Sand and distilled water (2 per cent) it serves as a valuable control medium for checking reproducibility of laboratory core sand data.

Working samples may be purchased from our Cleveland factory.

O. J. MYERS, *Tech. Dir.*
Foundry Products Div.
Archer-Daniels-Midland Co.
Minneapolis

Dublin dispatch

During the past year there has been a slight recession in the foundry industry in this country but all of the foundries have weathered the storm and some improvements have been noted as the year draws to a close. Supplies of scrap and coke have been quite plentiful but pig iron is still unobtainable from our former sources of supply in Great Britain, with the result that we have had to purchase our supplies from the Continent at very high prices. Earlier in the year the price of pig iron from the Continent was £36 ($102) per long ton but this is showing a gradual drop and our latest quotation for January 1953 delivery is £26 ($73) per long ton. The corresponding price, if purchased from Great Britain, would be in the neighborhood of £15 ($42) per long ton.

I represented this country at the first European Seminar on Foundry Productivity held in Paris in November and while there had the pleasure of meeting several American foundrymen who attended as observers.

We in the foundry industry are looking forward with optimism to the opening of the New Year and trust that our associates in America continue to prosper during 1953.

S. W. AITKEN, *Director*
Hammond Lane Foundry Co., Ltd.
Dublin, Ireland

Awaits symposium

I understand that the symposium, from which the article *"Jolt-Rockover Molding Machines"* (AMERICAN FOUNDRYMAN, November 1952, page 36) was taken, will cover the full field of molding equipment. Is it possible for us to get this symposium now?

C. C. SALVAGE, *Works Eng.*
James B. Clow & Sons
National Cast Iron Pipe Div.
Birmingham, Ala.

The symposium on molding machines is being extended at the 1953 Convention to cover coremaking. These papers, sponsored by the Plant & Plant Equipment Committee of A.F.S., will be published after this year's convention in a combined symposium on molding and coremaking equipment.

American in Turkey

Harold E. Henderson, H. C. Macaulay Foundry Co., Berkeley, Calif., on loan to the Turkish Government as a foundry sand consultant, has written several letters to A.F.S. and to Clyde A. Sanders, American Colloid Co., Chicago, from Ankara. Excerpts printed below will make foundrymen who fancy they suffer "hardships amid plenty" appreciate their lot.

From this brief visit I feel very strongly about one thing—that the American people should be much more fully informed about the Turkish situa-

continud on page 106

▶ Board eases production control

Production control board in office of Dee Brass Foundry Inc., Houston, Texas, simplifies job of keeping orders moving and scheduling use of equipment. Vertical cords indicate dates and deadlines. Pegs attached to horizontal cords are moved across board from left to right as job moves through shop. Orders hung in vertical file at left identify each peg.

a good turn

for large metal patterns

This big Bullard Turning Lathe is an unusual piece of equipment to be found in a pattern shop . . . its normal habitat is the production line where volume output offsets its investment. At City Pattern it is used to machine large metal patterns because it provides accuracy at maximum economy of time and money.

This is another indication of the unusual facilities to be found at City Pattern Foundry & Machine Co. for the crafting of the finest in metal patterns and other foundry equipment. Such facilities, manned by experienced hands, are your assurance that a pattern bearing this name has been produced accurately and by the most practical and economical modern methods. These "stand-out" facilities, coupled with conscientious effort to produce the best in patterns, are the very reasons that leading manufacturers rely on City Pattern Foundry & Machine Company for patterns that stand out in use.

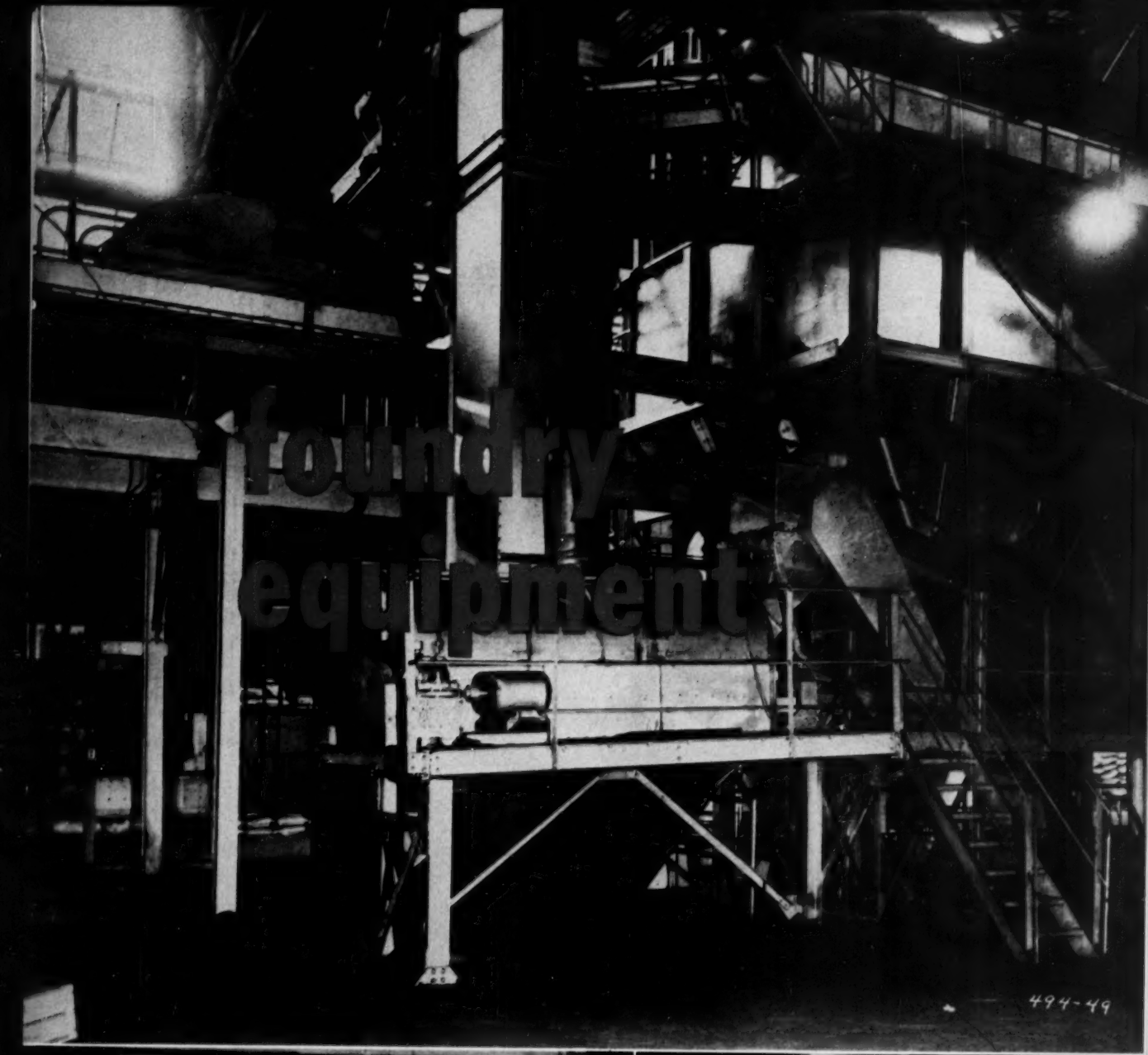
City Pattern Foundry & Machine Company's Shrinkage Conversion Tables save time and eliminate errors in shrinkage calculations. Your letterhead request will bring a set of these handy tables without obligation.

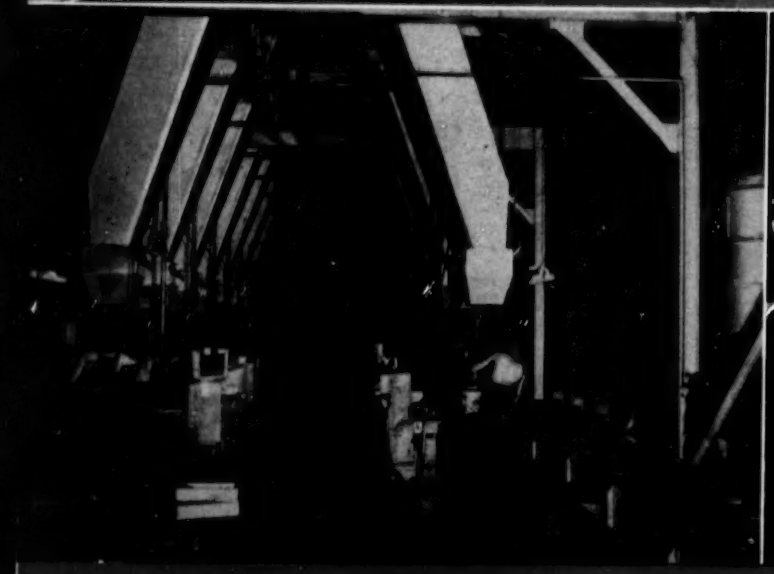
40th Anniversary
1913-1953

Setting the Pattern in Patterns

CITY PATTERN
FOUNDRY AND MACHINE CO.

1161 HARPER AVENUE • DETROIT 11, MICHIGAN


foundry
equipment
494-49



COMPLETE HANDLING SYSTEMS

for SAND... MOLDS... CASTINGS... COKE

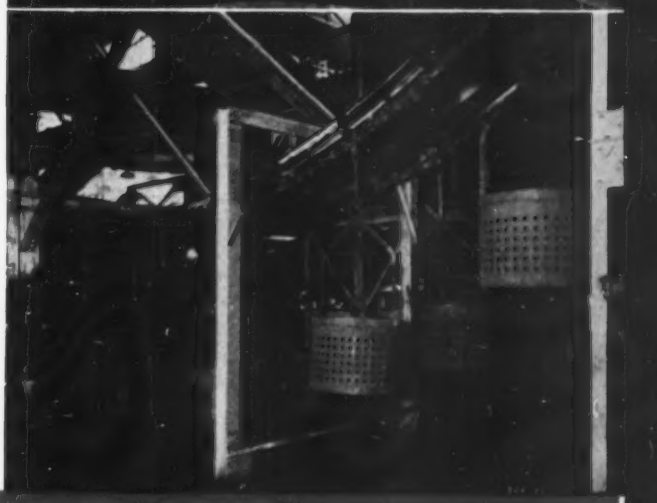
APRON AND BELT CONVEYORS

AERATORS — BLENDERS	FLASK FILLERS
CLEANARATORS	MOLD CONVEYORS
CRUSHERS	PADDLE MIXERS
BUCKET ELEVATORS	ROTARY SCREENS
DISINTEGRATORS	SANDITIONERS
FEEDERS	CHAINS

Includes Survey Study and Preparation of Equipment Layouts

Send for our New Catalog No. 845

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. FEMA



THE JEFFREY MANUFACTURING COMPANY

977 North Fourth St., Columbus 16, Ohio

Material Handling Processing and Mining Equipment

JII

Baltimore 2 Boston 16 Cincinnati 2 Detroit 13 Houston 2 New York 7 St. Louis 1
Beckley, W. Va. Buffalo 2 Cleveland 15 Forty Fort, Pa. Jacksonville 2 Philadelphia 3 Salt Lake City 1
Birmingham 3 Chicago 1 Denver 2 Huntington, Ky. Milwaukee 3 Pittsburgh 22

Jeffrey Mfg. Co. Ltd., Montreal, Canada
British Jeffrey-Diamond Ltd., Wakefield, England
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S. A.
The Galion Iron Works & Mfg. Co., Galion and Uhrichsville, Ohio
Galion (Great Britain) Ltd., Wakefield, England
The Ohio Malleable Iron Co., Columbus, Ohio
The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio

The Shipbuilding Industry
DEPENDS ON METALS

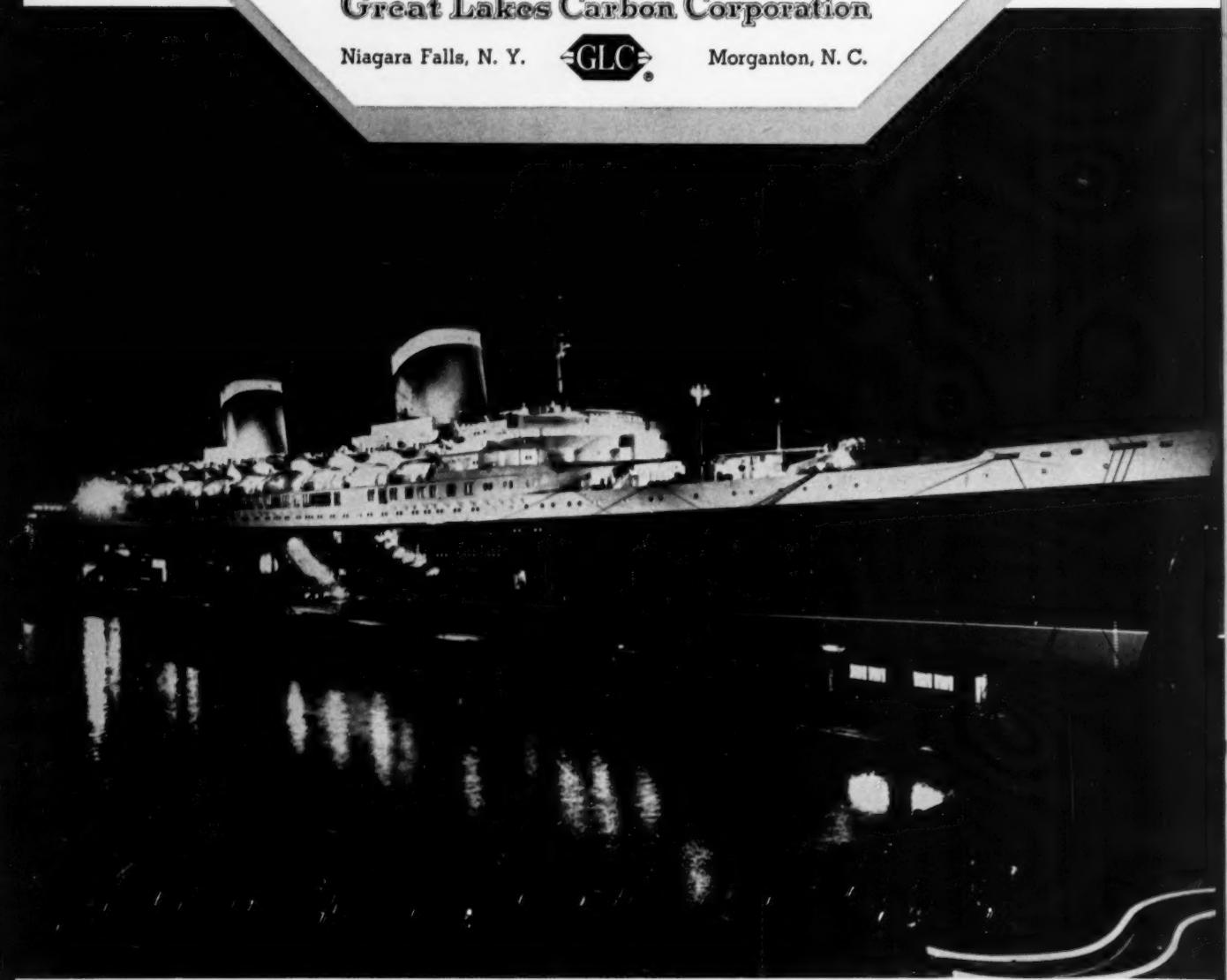
Leading manufacturers of electric steel, foundry metals, ferro-alloys and magnesium for the shipbuilding industry find that **GLC Graphite Electrodes** perform economically and dependably.

GLC Graphite Electrodes are built for quality every step of the way from raw materials to finished products. Metal producers can depend on them for uniformity, strength, low oxidation.

ELECTRODE DIVISION

Great Lakes Carbon Corporation

Niagara Falls, N. Y. GLC Morganton, N. C.



Courtesy Newport News Shipbuilding and Dry Dock Company

Graphite Electrodes, Anodes and Specialties

Sales office: Niagara Falls, N. Y. **Other offices:** New York, N. Y., Chicago, Ill., Pittsburgh, Pa.

Sales Agents: J. B. Hayes, Birmingham, Ala., George O'Hara, Long Beach, Cal., Great Northern Carbon & Chemical Co. Ltd., Montreal, Canada.

Get the facts

ON ELECTRONIC CORE BAKING

FOUNDRIES using THERMEX* Electronic Core-baking Equipment report greater core room yields, resulting from high baking speed. Labor costs are cut drastically. In addition, rejects and irregularities are reduced, and dimensional stability improved.

A new THERMEX booklet will bring you up-to-date on the efficiency of modern electronic core-baking. It includes engineering economy studies made in various foundries. Comparative cost figures for old and new methods are based on actual usage, and have been approved and released *by the foundries concerned.*

Get the latest facts for yourself—send the coupon now. The Girdler Corporation, Thermex Division, Louisville 1, Kentucky.

*THERMEX - Trade Mark Reg. U.S. Pat. Off.

The GIRDLER Corporation
Thermex Division

The Girdler Corporation
Thermex Division
224 East Broadway
Louisville 1, Kentucky

Please send me the new booklet on Electronic Core-baking

Name _____

Position _____

Company _____

Address _____

City _____ *State* _____

42 FURNACES OVER A MILLION TONS...

and still going strong with

NATIONAL CARBON
TRADE - MARK

BLAST FURNACE LININGS

Of these 42 "National" carbon-lined blast furnaces, 13 original linings have produced from 1 to 1½ million tons; 18 from 1½ to 2 millions; 10 have produced between 2 and 2½ millions; and 1 lining has topped the 2½ million ton mark. Every year more "National" carbon goes in . . . *stays* in to produce record tonnages, record low cost and *smooth* operation. More and more, it pays to watch the growth of CARBON in modern steel-making equipment.

•

The term "National" is a registered trade-mark of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, New York

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

IN CANADA: National Carbon Limited
Montreal, Toronto, Winnipeg

OTHER NATIONAL CARBON PRODUCTS

BLAST FURNACE LININGS • BRICK • CINDER NOTCH LINERS • CINDER NOTCH PLUGS • BRUSHES
ELECTRIC FURNACE ELECTRODES • SPLASH PLATES • RUNOUT TROUGH LINERS • MOLD PLUGS

Foundrymen in the news

M. J. O'Brien, Jr. has resigned as works manager of Symington-Gould Corp., Depew, N.Y., to become assistant to president in charge of factory operations at Vulcan Iron Works, Wilkes-Barre, Pa. A national director of A.F.S., Mr. O'Brien was connected with Symington-Gould for 26 years before assuming his new responsibilities. A native of St. Louis, Mr. O'Brien attended high school there and then completed mechanical engineering courses through the International Correspondence Schools before joining American Steel Foundries, E. St. Louis, Ill., as laboratory assistant and later apprentice at the Granite City, Ill., plant. He joined Symington-Gould in 1926 as an apprentice, served through the molding departments and then, successively as assistant foreman, foreman, assistant superintendent, superintendent, and assistant works manager in 1949.

"Marty" O'Brien has long been active in A.F.S. chapter and committee work, serving a number of years as director, vice-chairman and chairman of the Western New York chapter. Elected to the A.F.S. Board in May 1950 to fill the unexpired term of the late **A. M. Fulton,** Northern Malleable Iron Works, St. Paul, Minn., Mr. O'Brien was re-elected for a three year term at the 1951 Convention.

United States Pipe & Foundry Co., Burlington, N. J., appointed **Carl N. Brown** sales manager for cast iron pipe. Mr. Brown has been connected with the sales department since shortly after his graduation from Brown University in 1925.

Marion J. Allen has been promoted to director of personnel and public relations of American Steel Foundries, Chicago. Before joining American Steel in 1946 as assistant to the president, Mr. Allen was personnel director of the Chicago Ordnance District of the United States Ordnance Dept. He is also president of Foundry Educational Foundation. **C. L. Hoater** will head American Steel's newly formed transportation equipment division with **G. H. Snyder** assisting in a staff capacity; **C. E. Gringsby** in charge of sales, **E. A. Walcher, Jr.,** in charge of manufacturing, and **R. B. Cottrell,** chief mechanical engineer. **R. D. Brizzolara,** who now heads American Steel's Elmes & King Div., will be in charge of the newly organized Hammond Div. with **E. L. Krejci** as general manager, **R. W. Clyne,** sales manager, **M. W. Kraegel,** works manager, and **C. E. Tack,** product engineering manager.

Marion J. Allen . . . . . directs personnel.

M. J. O'Brien . . . now with Vulcan Iron.

William S. Pellini interprets the work that has been done over some eight years in evaluating the foundryman's most important foundry tool—heat transfer—in the first of two articles starting on page 69. As head of the metal processing branch of the Naval Research Laboratory's metallurgy division, he has directed many studies of heat transfer and he combines this background with the chairmanship of the A.F.S. Heat Transfer Committee to explain the development of a new outlook on solidification of metals. His explanations show why Heat Transfer sessions at A.F.S. Conventions, which at the start attracted little attention, now are better attended than many other meetings. The article will be concluded in the March issue and the entire paper will be presented during the 1953 convention.

Harold W. Lownie, Jr., has been appointed to a supervisory post in Battelle Memorial Institute's process metallurgy laboratories. He replaces **C. T. Greenidge,**

Harold W. Lownie . . . to supervise research.

B. H. Regenburg . . . . becomes treasurer.

W. S. Pellini . . . . practical heat transfer

E. A. Schoefer . . . . . advanced by ACI.

J. B. Caine . . . . disinters knock-off risers.

J. M. Bandel . . . . . new Electro Met VP.

who has been appointed assistant to the director. Mr. Lownie will supervise much of Battelle's research related to foundry practice and ore reduction. He is chairman of the A.F.S. committee on inoculation and the ASTM A3 committee on microstructure of cast iron. He has also served on division committees on test-bar design, executive matters, and revision of the A.F.S. *Cast Metals Handbook*.

Bernard H. Regenburg succeeds **Lester W. Brann,** retired, as treasurer of Belle City Malleable Iron Co. Previous to his election Mr. Regenburg was attorney and secretary of Illinois Tool Works, Chicago.

Earl M. Strick, finishing superintendent Erie Malleable Iron Co., Erie, Pa., has been appointed a member of the Smoke Abatement Committee of the city of Erie. This committee consists of eight members representing various industries of Erie which consults and works with industries to help keep air polution to a minimum.

D. Pat Cromwell is the new manager of blast furnaces and coke ovens of Ford Motor Co., Rouge plant, Dearborn, Mich. He succeeds **Dan L. Newkirk** who has retired after more than 34 years with the company.

Norman E. Risk and **Richard S. Frank** have been named assistant chief engineers at Caterpillar Tractor Co., Peoria, Ill. The appointments topped a series of 24 in Caterpillar's engineering department.

John M. Bandel has been appointed vice-president of Electro Metallurgical Co., a division of Union Carbide & Carbon Corp., New York. For the past seven years he has been assistant to **E. H. Mangan,** who recently was made executive vice-president of the company. **Ralph N. Fitzpatrick** succeeds **E. E. Wright,** retired as district manager of the Cleveland office. Mr. Wright will carry on as sales consultant in the Cleveland area.

Material Handling Institute elected as president **Howard M. Palmer,** Lewis-Shepard Products Inc., Watertown, Mass., at the organization's annual meeting in New York. **Charles B. Elledge,** General Electric Co., Schenectady, N. Y., and **Walter E. Schirmer** Industrial Truck Div., Buchanan, Mich., were elected first and second vice-presidents.

S. L. Gertsman comes up with a short paper on high manganese steel (page 48) to show that pouring temperature has a direct influence on grain size. As head of the steel and steel castings section, physical metallurgy division, of Canada's Department of Mines and Technical Surveys, Mr. Gertsman has

S. L. Gertsman . . . . why coarse grains?

contributed extensively to foundry research as well as to the solution of production problems.

Earnest A. Schoefer, formerly executive secretary of the Alloy Casting Institute, has been elected to the newly created post of executive vice-president.

Two supervising Hyster Co., Portland, Ore., engineers have been promoted. **Milton Smith** has been named engineer of the company's new plant at Nijmegen, Holland. Mr. Smith formerly was head of the lift truck design engineering department. He will be replaced by **Paul Brainard,** who formerly headed the standards division. Mr. Brainard has been with Hyster since 1940.

Robert Guelcher has been appointed industrial engineer by Ajax Flexible Coupling Co., Inc., Buffalo, N. Y. He was formerly assistant works manager of Uniflow Manufacturing Co., Erie, Pa.

Fred B. Porter, vice-president of American Council of Commercial Laboratories, Inc., Automatically succeeded to the presidency of ACCL upon the death of **Gustavus J. Esselen.**

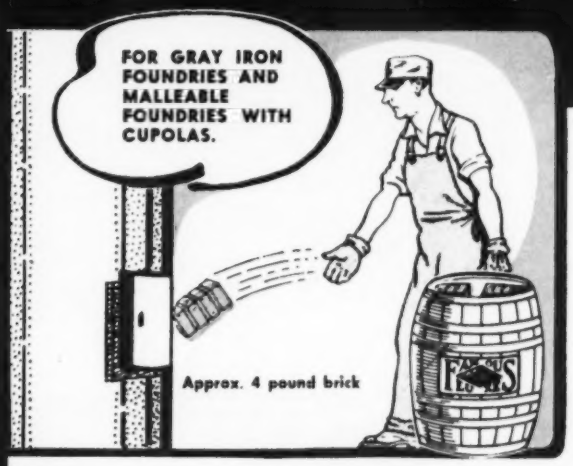
John R. Hersey has been named assistant sales manager of C. O. Bartlett & Snow Co., Cleveland. In addition to his duties as supervisor of all sales activities, Mr. Hersey will continue to head the company's coal handling department. **Harry C. Orr,** formerly assistant in the foundry sales department, has been named manager of the company's standard products and repair parts sales and service department.

J. B. Caine digs up a number of reasons for and against necked down risers in "*Washburn Cores Disinterred*" on page 51. He thinks foundrymen who don't use knock-off risers are missing a big bet and doesn't go along with more than two objections to them. And he doesn't believe either of these is significant. Jack Caine is widely known as a consultant, technical speaker, and author of technical papers and magazine articles. He's written this story in the no-holds-barred style he usually reserves for discussion at an A.F.S. Convention Shop Course or after presentation of a paper.

William G. Christy has resigned as director of New York's Bureau of Smoke Control to open an office as consulting engineer, New York. He will specialize in problems of air polution control, combustion, fuel and refuse burning, and smoke control. Mr. Christy has been an active member of ASME for many years. In 1925 as chairman of the St. Louis section, he helped organize the Citizens' Smoke Abatement League of that city. In 1930 he was called to Hudson County, N. J. to organize and head the first County Smoke Regulation Dept. in the United States. In 1950 he was appointed director of New York Smoke Control Bureau as well as chairman of the Smoke Control Board. He has also been active in NSPE, serving as vice president

continued on page 109

A Certainty!



BETTER CASTINGS, *a certainty, too,*

WHERE FAMOUS CORNELL CUPOLA FLUX IS USED WITH EVERY CHARGE OF IRON.

Famous CORNELL CUPOLA FLUX

The metal cleanser with over 34 years' success in gray iron foundries and malleable foundries with cupolas.

- PURGES MOLTEN IRON OF IMPURITIES, MAKES IT HOTTER, MORE FLUID, AND GREATLY REDUCES SULPHUR.

The old bugaboos—chilled sides, hollow centers, etc. are practically nil.

You'll find machining a lot easier, too.

Pre-Measured

SCORED BRICK FORM

Ready for instant use. No weighing, no measuring. No digging out of container. You simply lift Famous Cornell Cupola Flux out of container and toss it into cupola with each ton charge of iron, or break off one to three briquettes (quarter sections) for smaller or fractional charges, as per instructions.

FAMOUS CORNELL CUPOLA FLUX

- **KEEPS CUPOLAS CLEANER.**
- **REDUCES MAINTENANCE.**

The photos at right will give you a comprehensive idea of the efficient action of this flux in keeping cupolas clean. Bridging over is practically eliminated and drops are cleaner. *Another important advantage* in using Famous Cornell Cupola Flux is the protection it gives to cupola lining. A glazed or vitrified surface is formed on brick or stone, reducing erosion, patching, etc.

WRITE FOR BULLETIN NO. 46-B

THE CUPOLA before using Famous Cornell Cupola Flux.

THE CUPOLA where Famous Cornell Cupola Flux is used.

The Cleveland Flux Co.

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS CORNELL FLUXES

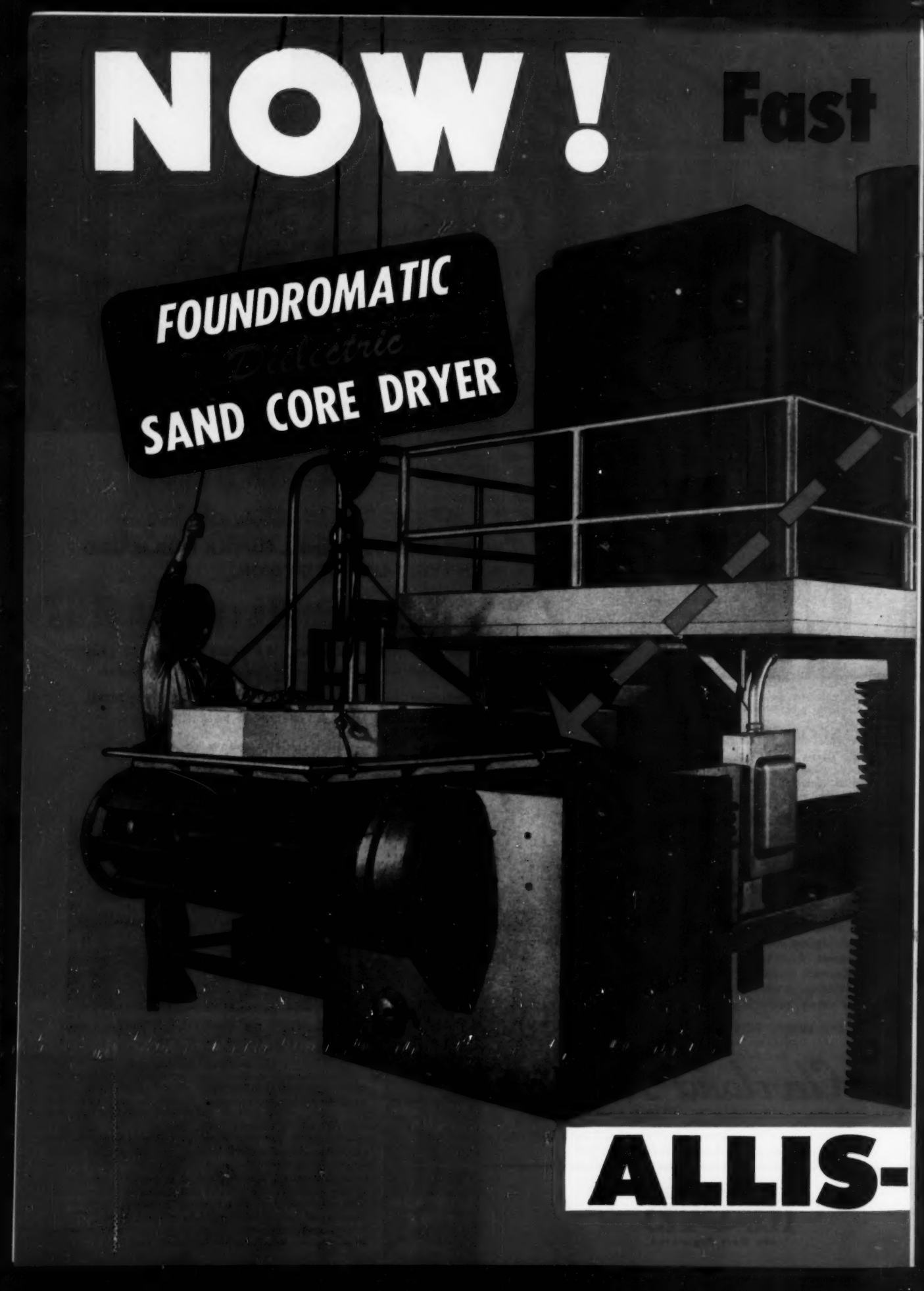
Trade Mark Registered

BRASS FLUX

FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.


NOW!
Fast
FOUNDROMATIC
Dielectric
SAND CORE DRYER
ALLIS-

Core Drying—even on metal plates!

Acme Aluminum Alloys, Inc. dries up to 800-pound cores in 22 minutes or less on metal plates in Foundromatic dryer

Here's the first dielectric core dryer to dry cores on metal plates as fast as on plastic plates.

This new model *Foundromatic* dryer was developed to meet the demand for accurate cores for the jet engine program. Because of the large size of the cores and the extreme accuracy required, metal plates were necessary. But dielectric core drying on metal plates had never before been economically feasible.

The new model *Foundromatic* dryer makes dielectric core drying on metal plates simple.

HOW IT WORKS

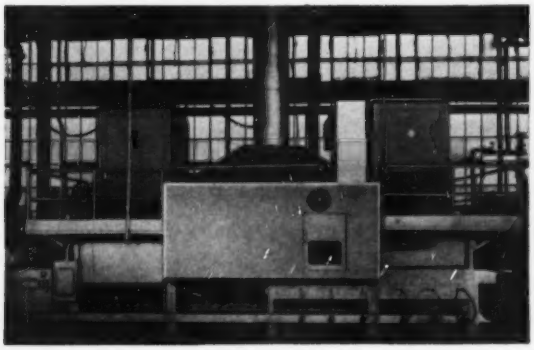
Resistance heating elements, located in the infeed tunnel beneath the slat type conveyor belt, direct heat upward to the bottoms of the metal plates. This supplementary heat solves the problem. Formerly a chilling action was imparted by the metal plate to the core surface while in the dielectric field. This chilling resulted in wet or uncured sections of the core, and extended heating time was required. Even this was not always a solution. Now chilling is eliminated . . . cores come out hard and dry.

RATING

This model is rated at 205,000 Btu's and will dry 3000 pounds of cores per hour at 3% moisture. Other ratings are available at 75,000 and 150,000 Btu's.

Find out more about this fast, economical way of drying cores. Call your nearby Allis-Chalmers district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Foundromatic is an Allis-Chalmers trademark.



A-C ALLIS-CHALMERS

CHALMERS

SEND A-3990

Complete information on Allis-Chalmers dielectric sand core dryer for drying cores on metal plates.

Name .....

Title .....

Company .....

Street .....

City ..... State .....

CRUCIBLE FURNACES melt all the metal

In this well known Eastern Foundry

Seven forced draft coke fired Crucible furnaces. No. 225 and No. 300 Crucibles are used according to quantity of metal desired.

THE PHILADELPHIA BRONZE AND BRASS CORPORATION

PRODUCER of non-ferrous castings, maintains uniform quality and meets specifications by using only Crucible melted metals.

MELTING EQUIPMENT consists of seven stationary coke fired furnaces (illustrated) each of 900 pounds capacity; three tilting Crucible furnaces (illustrated) oil fired, each 1200 pounds capacity and four stationary oil fired furnaces (not illustrated) 450 pounds capacity each.

CRUCIBLE FURNACES here, as in some 3000 other non-ferrous foundries in the United States, demonstrate their superiority in economy, flexibility and adaptability in the production of sound castings with minimum rejections.

Three tilting Crucible furnaces oil fired, using No. 430 long lipped Crucibles, 1200 pounds capacity each.

No. 300 Crucibles, 900 pounds capacity, are lifted from the stationary coke fired furnaces carried directly to the molds and poured.

THESE FIRMS CAN TAKE CARE OF ALL YOUR REQUIREMENTS FOR CRUCIBLE MELTING

CRUCIBLE MANUFACTURERS ASSOCIATION
40 EXCHANGE PLACE NEW YORK 5, N. Y.

Ross-Tacony Crucible Co.
Vesuvius Crucible Co.
Joseph Dixon Crucible Co.
Lava Crucible-Refractories Co.
American Refractories & Crucible Corp.
Electro Refractories & Abrasives Corp.

The must-not-be forgotten man . . .

■ Management expects the foreman to keep production processes rolling . . . to teach production methods, often to relatively unskilled men who lack the craftsman's touch . . . to keep workers safety conscious . . . to improve work processes. The foreman is recognized as a key figure in these activities. But does management always remember to treat him as a member of the management team?

Does management provide the foreman with the information required to promote company principles and plans with the workers? If not, the important role the foreman can play as part of management is not being properly filled and he is truly the forgotten man.

What happens when the foreman is forgotten? He may become part of a third group in the plant—neither management nor production. He's then neither fish nor fowl for while he appears to be functioning as part of management, he's not interpreting company policies for the workers.

The forgotten foreman may lose his management effectiveness completely by identifying himself wholly with the production workers. Then he's in a difficult position so far as management's interests are concerned.

Continuity of management thinking through the foreman to the men working under him can be assured in several ways. One of the most effective is the foreman training conference. Properly planned, with a well-prepared discussion leader and an optimum-sized group of 12 to 15 (as recommended in the A.F.S. *Guide for Foreman Training Conferences*), a series of conferences can markedly increase the supervisory effectiveness of the foremen who participate.

All the men in the group may be from the same large plant. But a group of small plants can profitably conduct foreman training conferences jointly. The problems of dealing with people are essentially the same in the various shops although the situations vary from plant to plant, even from day to day in the same plant.

How many forgotten foremen are there . . . these men remembered when foundry know-how is needed, but forgotten where instruction in policy, methods improvement, effective leadership—yes, even basic economics and the American way of life—are concerned. In a country which exemplifies improvement in living standards through increased production, the man closest to those who perform the production processes dare not be forgotten.

Our turn to take stock . . .

■ Evidence of improved productivity in Europe is reported regularly by visitors returning from overseas who have seen some of the changes stimulated, at least in part, by the productivity teams to which American foundrymen played host.

At the first European seminar on foundry productivity held in Paris in late 1952 under auspices of the Organization for European Economic Cooperation, foundrymen reported reduced man-hours per ton, introduction of profit-sharing plans, enthusiastic and profitable response to installation of a suggestion system, and marked reduction in material handling movements.

Meanwhile, American foundrymen are examining conditions in the U. S. Here in this country there is recent evidence that man-hour productivity has not been up to snuff in some plants, in spite of our having such modern equipment and plant layout as to cause Europeans to think of the U.S. as the "last word" in productivity. Maybe we ought to send our own productivity teams abroad to see what those fellows picked up when they were over here!

It might be that what they really picked up here wasn't machines, or methods, or gadgets and gimmicks. Maybe they caught on to the one thing that has *really* made our production great—the *spirit* of the men who design and run them.

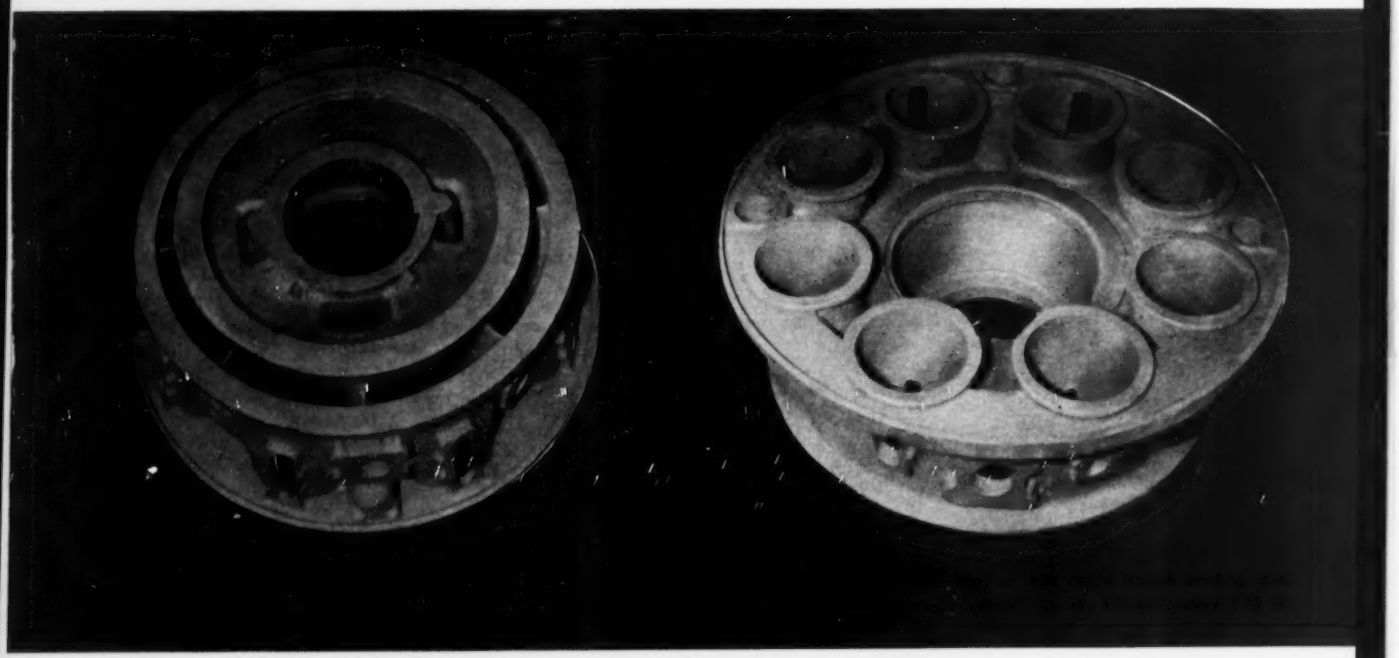
Castings with a pedigree

CARL R. LOPER / *Application Engineer, Allis-Chalmers Mfg. Co.*
JAMES D. CLAFFEY / *Asst. Mgr. Foundries, Acme Aluminum Alloys, Inc.*
FRANK L. WALDENMEYER / *Fdry. Supt., Acme Aluminum Alloys, Inc.*

Precision castings with controlled composition and mechanical properties and guaranteed soundness are standard practice at Acme Aluminum Alloys. Here's how the company does it, filling in a check list of tests and properties which follows each casting—starting with the cores which make up the mold—from foundry to installation of the part. The operation revolves around the first dielectric unit to handle resin-bonded cores on metal plates.

■ The urgency of America's defense program coupled with the increasing quality and accuracy requirements in castings for the Atomic Energy Commission, Air Force, Army and Navy has presented a challenge to the foundrymen of this country. Higher strength and heat resistant alloys for elevated temperatures or stratospheric cold demand castings of dimensional accuracy to withstand greater impact and shock without added weight. Many radical changes in core and molding practice have been developed by the industry in recent years to meet that challenge in the foundry. This has been especially true at Acme Aluminum Alloys, Inc., Dayton, Ohio, where unusually intricate aluminum castings of all types are being made. Some in high production quantities, some in sample lots, and others in carefully controlled production and supervised operations. It is this last group which illustrates the care and attention to detail which is being used to produce castings with a pedigree.

One of the pioneers of the process of using complete core-mold assemblies for intricate castings, Acme has developed this practice through many years of use on intricate jobs resulting in sounder and more accurate castings with a maximum yield. This company—established in 1920 as the Acme Pattern Co.—early in 1941 developed the practice of



casting intricate parts for the Rolls-Royce engine in complete core-mold assemblies and has followed that practice since then.

At present, component parts of the J-47 jet engine are being cast in resin-bonded complete core-mold assemblies which are cured in a large dielectric core dryer. The story of Acme's latest achievement bears out the theory of progress by a well organized group of foundrymen intent upon the job of making better castings by better methods.

Confronted with a large scale program to supply the rear main frame casting for the J-47 jet engine, the personnel of Acme were faced with a decided lack of adequate oven capacity for handling the cores. The core-mold assembly consists of 95 cores which range in weight from 2 oz to 395 lb each. The casting itself is in excess of 190 lb. As exceptionally close tolerances are imperative in the finished casting, a minimum of core handling was necessary to eliminate sagged or damaged cores. In order to save time in assembling the finished cores and insure dimensional accuracy in the placement of the finished cores, the base core was designed with prints and various locating points. To further insure the accuracy desired it was necessary that the base core remain upon the plate on which it was baked for immediate assembly with the other cores.

The desire to utilize the fast curing properties of resin-bonded sand together with fast dielectric heating to supply the cores necessary for these assemblies lead to the development of the industry's first dielectric unit to handle resin-bonded cores successfully on metal plates.

Develop new core dryer

Engineers of the authors' companies held a series of meetings discussing the requirements desired in a unit of this type. Previously it had been considered impractical to cure resin-bonded cores on metal plates in a dielectric core dryer. Placing the core on a metal plate resulted in a chilling action being imparted to the core surface while in the dielectric field due to the shielding action of the plate. The chilling resulted in wet or uncured sections of the core in contact with the plate, a condition corrected only after extended study and change in the heating chamber. To change over to non-metallic plates and dryers was considered undesirable due to the large expense and time element involved in such a procedure.

In a series of experiments it was found that resin-bonded cores on metal plates could be cured in a dielectric field with success when the metal plates were preheated. Thus was developed the dual purpose dielectric core dryer which, by means of supplementary heat from radiant elements, develops sufficient heat in the metal plates or dryers to permit the dielectric field to properly cure the resin-bonded cores.

How the cores bake

This dielectric core dryer consists of an oven unit measuring 9 ft wide by 40 ft long including the conveyor, of which 40 sq ft is useful electrode or drying area through which the cores pass. A variable speed metal belt conveyor carries the cores on metal plates or in metal dryers through the infeed tunnel opening, which is 60 in. wide by 18 in. high, and over a series of radiant heating elements. These elements provide the means of bringing the metal plates and/or dryers up to the desired temperatures before the cores enter the dielectric field. The 60 kw output generator section which supplies the radio-frequency current is mounted on top of the infeed and exit tunnels to conserve valuable floor space. Moisture and fumes from the drying operation are exhausted to the outside.

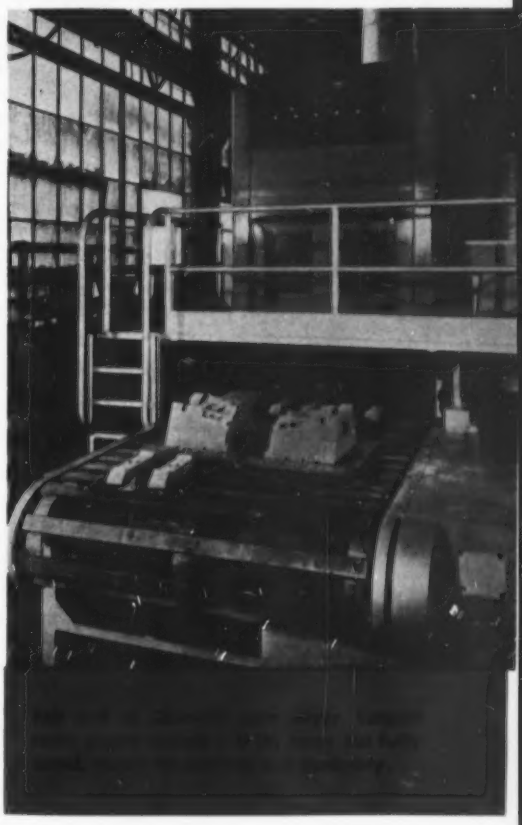
Core making is accomplished on benches, on blow machines and on combination jolt roll-over machines. All work area is placed conveniently adjacent to the infeed end of the conveyor which carries the cores through the dryer. This results in one handling operation from core maker to oven conveyor and contributes immeasurably to the dimensional accuracy of the finished cores by eliminating sagging, etc., which is often associated with several handling operations. Cores are not handled again until they emerge fully cured.

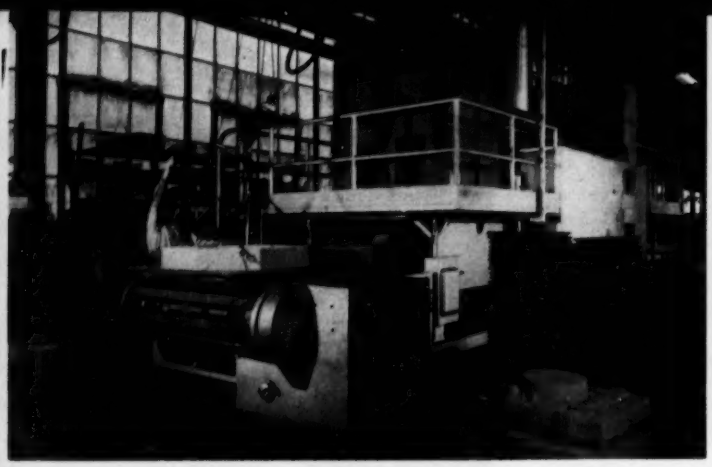
Typical composition of the resin-bonded sand mixtures consists of:

Ottawa Sand	400 lb
Bank Sand	150 lb
Cereal	5 lb
Urea Formaldehyde Binder	4 lb
Catalyst	1 lb
Glycol	1 qt
Release Agent Mixture	3 qt
Water	1¾ gal

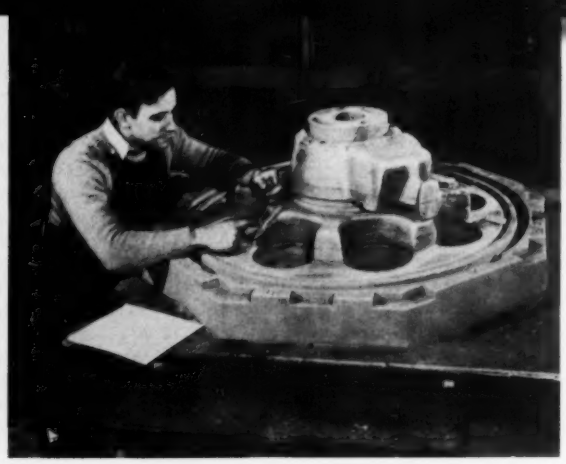
All cores, regardless of size or dryer requirements, are cured at the

Loading end of dielectric core dryer with cores on metal plates and dryers. One blower, three jolt-rollover, and two jolt machines are grouped around in-feed end.





Cope core being removed from dielectric unit weighs 395 lb. Total core weight for "casting with a pedigree" is over a ton.



Assembly of core-mold for jet engine casting starts shortly after drag core is cured. Pedigree sheet lies on core plate.

same time. There is no necessity for frequent adjustment of the electrode height to compensate for variations in core sizes. The amount of power drawn from the generators is proportional to the mass of cores under the electrode. As the power factor or ability of the core to absorb heat energy is much higher for a wet core than for a dry one, the equipment automatically protects the small cores from over-curing. As the cores enter under the electrode the moisture present causes an increase in the power supplied by the generator. As the cores dry out the power automatically decreases to a minimum.

The ability to handle the various sized cores in this assembly without overbaking or burning thin sections allows the progressive assembly of each core-mold without the necessity of storage for a number of cores.

Bakes large cores fast

The largest core in the assembly is cured in 10 to 12 min while a complete assembly of over 2000 lb is possible every 40 min. Several cores weighing over 800 lb are completely cured in 20 to 22 min without overbaking thin sections of the core. These are average times from the placement of the core on the conveyor belt until its removal at the discharge end. One noteworthy accomplishment by Acme's foundrymen has been the elimination of many rods and wires formerly used for strengthening and support. Such rods and wires as are still necessary are placed so that they do not interfere with the dielectric field while they pass through the oven.

Due to the necessity of checking each detail on each casting daily to insure rigid inspection quality on the jet engine frame castings a procedure was inaugurated whereby each core as it is removed from the oven is given a serial number, which will identify each casting through all operations including the machine shop. At the same time a casting flow sheet or "pedigree" is established for each casting. All information on core quality, any difficulty experienced in core making or assembly, gauge reports on core setting, metal pouring temperatures and pouring time, cleaning room inspection reports, laboratory reports, etc., are recorded for future reference if required. In short, every operation pertaining to the making of this casting is carefully noted. This pedigree has been very valuable in tracing and recording any change in technique or procedure or in determining the causes of discrepancies which may develop while the casting is being machined.

Cores are removed from the conveyor belt as soon as they emerge from the core dryer, fins are removed and cores are finished where necessary. Any required core washes are applied immediately and dried from the residual heat within the core. As the cores are usable almost immediately, the assembly operation proceeds smoothly and efficiently with no lost time for extra core handling or storage for cooling.

Because of the large number of individual cores making up the assembly, care must be exercised in fitting each together. The accuracy retained by the resin-bonded cores reduces filing and grinding to a minimum. Jigs are used to insure accuracy of alignment, which, with the base core prints as a guide, results in castings to within $\frac{1}{32}$ inch in tolerance. The pedigree sheet insures the correct placement of each core in the assembly and eliminates the possibility of any cores being left out.

The aluminum alloys used for the casting undergo the usual strict melting and pouring practices which Acme considers necessary for all their castings. Melting temperatures are controlled by means of immersion thermocouples connected to constantly recording potentiometers. Fluxing is a strict procedure at definite temperature ranges, while pouring temperatures are controlled by means of portable temperature control equipment. Completed core-molds are poured off on the assembly floor. Due to the size of the core-mold considerable smoke and fume are developed so the core-molds are transported to an outside yard for smoking off and cooling. After cooling the core-molds are transported by fork-lift trucks to the shakeout station.

Strict inspection

The castings undergo strict inspection dictated by the procedure outlined on the pedigree sheet. All castings require a definite heat treat procedure to relieve solidification stresses. Each casting is then subjected to exhaustive tests which include an elaborate "target" operation which checks for dimensional accuracy and establishes definite location points for final machining operations. Following the target inspection the castings are subjected to a 2½ hr x-ray inspection which includes some 32 exposures and is in turn followed by dye tests and fluorescent penetrant inspections. Regular test bar procedure for mechanical and chemical properties is used on each casting in the Acme laboratories.

The high percentage of acceptable castings is a tribute to the ingenuity, resourcefulness and down-to-earth principles of good sound foundry practice by the personnel of Acme Aluminum Alloys, Inc., justifying their pride in pedigreed castings.

Program taking shape rapidly for 1953 CONVENTION

■ With the appointment of convention committees by Chicago Chapter officers and directors, plans for the 1953 A.F.S. Convention—to be held in Chicago May 4-8—approach the final stages. Plant visitation plans are well under way. Technical programs are nearly complete and Program and Papers Committees are finishing selection of session co-chairmen and discussion leaders and giving papers final approval.

Housing applications, which were sent to all members the middle of January, already are coming back to the four hotels designated for convention housing. Unlike Conventions of the past 11 years, there is no Housing Bureau. Room applications are sent by each applicant directly to the hotel of his choice—Bismarck, LaSalle, Morrison, or Sherman. More rooms have been made available by these four closely-grouped hotels than have been available for any previous non-exhibit foundry Convention anywhere.

Can register in advance

Registration fee for the 1953 A.F.S. Convention will be $2 for members, $5 for non-members. Advance registration, which has been so successful the past two conventions, will be used again in 1953. Return of the card being sent to all members late in February, along with $2, will bring a Convention badge by early mail. At the Convention, the advance registrant merely wears his badge and walks right in.

All company and sustaining members will receive forms enabling them to register in advance any employee, whether the individual is a member of A.F.S. or not, at the member fee of $2.

Heavy attendance to match the expanded—five instead of four days—program is expected. Technical sessions now scheduled, including the Hoyt Annual Lecture, number 52. Most of these are the customary meeting with two or more papers. Two of the sessions scheduled for Wednesday, May 6, have been set aside for a Symposium on Sand Reclamation. Covered during these meetings will be all types of foundry sand reclamation equipment currently in operation on which service data are available.

Sand Reclamation Symposium papers already approved are: *"Development of Foundry Sand Reclamation," "Dry Reclamation of Steel Molding Sand," "Hydraulic Method of Wet Sand Reclamation," "Sand Reclamation in a Steel Foundry,"* and *"Control of Coating Characteristics Affecting Thermal Stability and Pneumatic Dry Scrubbing of Reclaimed Sand."*

Another symposium, sponsored by the Plant and Plant Equipment Committee, extends the popular meetings of last year into the field of coremaking equipment. Sessions are scheduled for the afternoon and evening of Thursday, May 7. The 1952 symposium on molding machines will be combined with this year's papers on coremaking in a publication expected to be available sometime after the 1953 Convention.

Seven of the sessions will be luncheon or dinner meetings, most of them featuring the informal give and take of ideas convention-goers associate with the round table luncheons. Luncheon discussion topics announced by the five metals divisions and the Pattern Division are: Gray Iron, Thursday, May 7—*"Scrap Reduction"*; Pattern, Wednesday, May 6—*"Questions and Answers"*; Light Metals, Monday, May 4—*"Shell Molding"* or *"Surface Finishes"*; Brass & Bronze, Tuesday, May 5—will repeat popular discussion of prepared questions (chapters are being canvassed now to determine their interests); Steel, Thursday, May 7—*"Hot Tearing"*; and Malleable, Tuesday, May 5—to be announced.

The customary dinner sponsored by the Educational Division is set for the evening of Tuesday, May 5.

Board of Trade topped by cast aluminum statue of Ceres dominates the south end of LaSalle St. in Chicago Loop.

Eight shop course sessions are planned. The only Convention sessions not requiring a badge for ad-

mission, they are scheduled for evening to accommodate operating men who may not be able to attend during the day. These sessions are free-for-all discussions with no prepared papers. All shop course sessions start at 8:00 p.m. The Gray Iron Shop Course will run the evenings of May 4, 5, and 7. Discussion topics scheduled are: *"Gating, Risering, and Pouring and Their Relation to Scrap," "Chill Control,"* and *"Carbon Control in the Cupola."*

The Sand Shop Course, also May 4, 5, and 7 will have for discussion: *"Pinholes in Castings," "Evaluation of Molding Processes—Green Sand, Permanent Mold, Die Casting, Shell Mold, Core Sand, and Dry Sand,"* and *"Mulling Techniques in Relation to Casting Quality."* Topics for the Brass & Bronze Shop Course, scheduled for May 4 and 5 will be announced.

Fred B. Skeates, Link-Belt Co., is general convention chairman for 1953 meeting.

Several papers on titanium melting and casting—first to be presented at an A.F.S. Convention—will be heard during sessions sponsored by the Light Metals Division.

Many of the 1953 papers have been received and are being edited in preparation for distribution as preprints some 30 days prior to the Convention. An order form for preprints, which are distributed gratis to all A.F.S. members on request, will be sent to members of the Society about April 1. As in the past some Convention papers will appear in AMERICAN FOUNDRYMAN in lieu of preprinting; the first of these are in the current issue (page 65) and others will appear in March and April.

Traditional social events of the Convention are concentrated in the middle three days of the week to accommodate the greatest number of conventioneers. The Annual Banquet, featuring presentation of Gold Medals and Honorary Life Memberships, will be held Wednesday evening, May 6. A.F.S. President I. R. Wagner, Electric Steel Castings Co., Indianapolis, will preside at the banquet and on the following day will preside at the Annual Business Meeting and present his Presidential Address. Election of officers and directors, and presentation of Apprentice Contest Awards are also on the Annual Meeting program.

The Charles Edgar Hoyt Annual Lecture, to be delivered by J. H. Smith, General Motors Corp., will follow the business meeting.

The Canadian Dinner is scheduled for the evening of Tuesday, May 5. Past presidents of A.F.S. will meet for their annual breakfast the morning of Wednesday, May 6, while past and present officers, directors, medalists, and honorary life members, who make up the Society's "Official Family," will attend the Alumni A.F.S. Dinner the evening of Thursday, May 7.

Name committee members

Appointments for 1953 Convention committees announced by the Chicago Chapter to date are headed by Fred B. Skeates, Link-Belt Co., as general convention chairman. Co-chairman is John H. Owen, Harbison-Walker Refractories Co. John A. Rassenfoss, American Steel Foundries, is vice-chairman of the General Convention Committee while Robert L. Doelman, Miller & Co., is secretary and James T. Moore, Wells Manufacturing Co., is committee treasurer.

Other members of the General Convention Committee are: Walter A. Balton, Link-Belt Co.; Robert Hendry, Love Bros. Corp.; E. E. Henry, Hammond Brass Works; C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp.; Fred L. Riddell, H. Kramer & Co.; Robert P. Schauss, Werner G. Smith, Inc.; Cecil F. Semrau, Illinois Malleable Iron Co.; and B. C. Yearley, National Malleable & Steel Casting Co.

Chairman and co-chairman, respectively, of the Banquet Committee are J. C. Gore, Archer-Daniels-Midland Co., and T. J. Magnuson, Champion Foundry & Machine Co. W. D. McMillan, International Harvester Co., heads the Publicity Committee. Chairman of the Reception Committee is M. K. Wells, Wells Manufacturing Co.

Plant Visitation Committee chairman is H. Kenneth Briggs, Miller & Co. Harold G. Haines, Semi-Steel Div., Howard Foundry Co., heads the Shop Course Committee. Walter W. Moore, Burnside Steel Foundry Co., and Frank B. Flynn, S. Obermayer Co., are chairman and co-chairman of the Ladies Entertainment Committee.

Contest closes soon

The 1953 A.F.S. Apprentice Contest closes March 1. All entries should be in Chicago by that date at the following address: Prof. R. W. Schroeder, University of Illinois, Navy Pier Branch, Dept. of Mechanical Engineering, Room 72, Chicago 11, Ill. Patterns and castings should preferably be shipped rail express, and in any case *shipping costs should be prepaid.*

Completed entries have been coming in since the middle of January, but number of plants and apprentices in the competition will not be known until final judging. To date, 10 chapters, plus three areas in Canada, are reported holding local contests and a number of plants outside these regions are sending entries.

Apprentices can still enter in one or more of the five divisions—metal patternmaking, wood patternmaking, and gray iron, steel, and non-ferrous molding. All apprentices in North America are eligible if they are taking a regular training course of not less than three years duration and are not over 24 years old on the day they prepare their entry. For veterans, the age limit is 24 plus the length of their term of service in the armed forces, according to Apprentice Contest Chairman Schroeder.

For details on the competition which pays $100, $50, and $25 in prizes in each division and round trip rail and Pullman fare between their homes and Chicago for the five first prize winners, write Jos. E. Foster, A.F.S. Headquarters, 616 S. Michigan Ave., Chicago 5, Ill.

▶ *Wanted—Used Copies Vol. 52, 56 & 58, Transactions of A.F.S.*

A.F.S. National Office is buying used copies of *Transactions* (Vol. 52, 1944; Vol. 56, 1948 & Vol. 58, 1950) at $2.50 each.

Demand for back issues is occasioned by new members coming into the society. Those turning in their volumes will be doing a service to these foundrymen.

Copies in good condition should be sent to American Foundrymen's Society, 616 S. Michigan, Chicago 5.

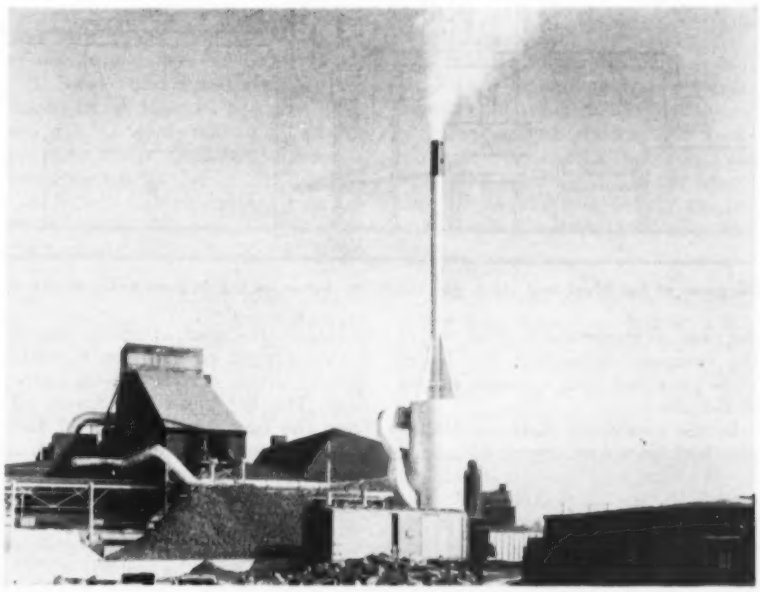
New cupola emission control equipment

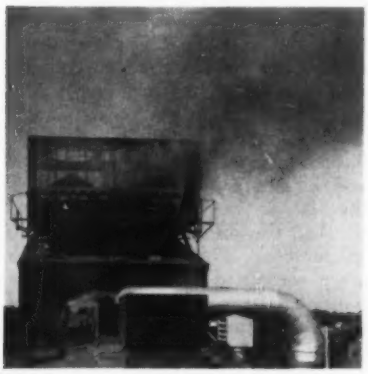
Gives faster melting . . . cleaner air

Melting rate increase of 20 per cent and better community relations have resulted from this new installation of air pollution prevention equipment. Cost of the installation will be recovered in 10 years or less through coke savings.

■ When the Indianapolis Works of National Malleable & Steel Castings Co. was established in 1882, the city was comparatively small. The foundry was built on the outskirts, considered at that time way out in the country. The plant had no residential neighbors.

National Malleable and other plants grew and expanded along with the community. For half a century the main concern of all was the growth of industry, and the building up of the community. Not too much attention was paid to the matter of smoke coming from railroad locomotives and the stacks of industry. As





Cloud of fume and smoke (left) shows how air was polluted by cupola before installation of control equipment. Above, sky is clear except for the steam.

long as smoke issued from these stacks everyone felt assured that business was good, that employment would be high, making for a higher standard of living for everyone in the community.

In recent years, however, Indianapolis viewed the smoke hanging over the city in a different light and decided to take steps to eliminate it. The city set up an air pollution prevention bureau. Industries cooperated with the bureau in developing means of eliminating smoke from their plants as their contribution to the campaign.

The intent was fine, but it is much easier to plan to eliminate smoke than to find air pollution control equipment that can be adapted to the various industrial operations. This was particularly true in the case of National Malleable. Management was willing and eager to do the job. The question was: How do it effectively? Residential areas had built up about the foundry and many of the old neighbors, often plant employees, recognized the problem. But many neighbors who had moved into the area did not know the problem. The newer neighbors read of the air pollution prevention campaign being carried on in the city, yet they saw smoke coming out of the foundry stacks.

In the meantime, National Malleable encouraged good relations with their neighbors. To demonstrate that the emissions which might come from a foundry process were not injurious to health or plant life, they planted flowers. An old building was removed from the grounds and in its place a flower garden was planted. Though this dressed up the plant and added to its attractiveness, primarily it demonstrated that the process would not injure the health of the neighbors or hurt plant life. The gar-

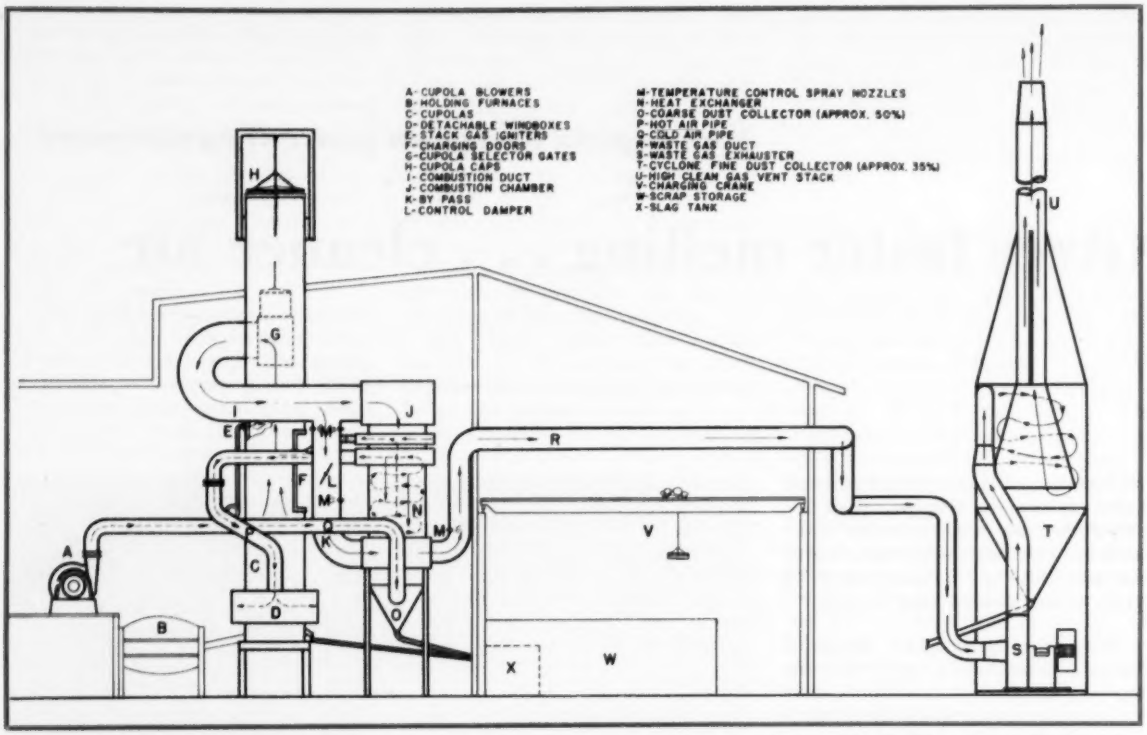


Diagram of hot blast and stack gas cleaning system at the Indianapolis Works of National Malleable & Steel Castings Co.

den was so successful that at one of the company gatherings, the ladies were provided with corsages grown at the plant.

In the meantime, National Malleable had been working on the problem of controlling the dust and smoke emitted by the plant. A study of how to do it and what equipment to install was started three years ago by W. W. Flagle, manager, B. E. Gavin, assistant manager, A. H. Thomas, plant engineer, and Wm. A. Zeunik, metallurgist. While working on the dust collection problem, thoughts of saving on raw material, particularly coke, and of increasing production came up. If they could increase production they could invest the savings in better collection equipment, which would justify the expenditure of larger sums of money for this purpose.

Originally the cupola stacks were equipped with conventional spark arresters. A screen house was added but was far from satisfactory as it would stop sparks only.

New equipment* installed includes a gas-fired after-burner at the charging door. This insures complete combustion of the carbon monoxide in the stack. The stack is tightly capped with a hinged cover plate, a safety device, which acts as an explosion door. The hot gases are drawn off from the two cupola stacks 11 feet above the charging door through a refractory-lined duct, which serves as an additional combustion chamber, to the heat exchanger. A gate in the duct permits either cupola to be operated with the collecting unit.

*Patents pending, Grindle Corp., Chicago.

Blast picks up heat

The gases enter an expansion chamber at the top of the heat exchanger. In the heat exchanger are 222 alloy steel tubes, 3 in. in diameter and 18 feet long. Primary fresh air for the cupola is drawn around these tubes by a 10,500-cfm blower fan. The hot gases pass down through the tubes, permitting the primary air to absorb heat from the exhaust gases.

When a cupola is operated on hot blast, the temperature of the blast must be uniformly controlled. This was one of the more difficult phases of the problem because there is considerably more heat in the waste gas than can be utilized to heat the blast at a constant, required temperature. Thermostatically controlled water sprays in the expansion chamber proved the solution to this problem.

After passing through the tubes of the heat exchanger, the gases expand and change their direction of flow to the exhaust duct. This results in dropping approximately 70 per cent of the heavier emissions in the waste gas to the cone-shaped bottom of the heat exchanger. This material is washed into the slag tank for disposal.

The waste gases are drawn from the heat exchanger by a 44,000-cfm fan located at the base of the exhaust stack. In the 190-ft duct connecting the heat exchanger and the stack, the gases pass through a washer and are cooled to approximately 350 F as they enter the stack at the base. The base is 15 ft in diameter and houses a cyclone collector. As the gases are drawn downward through the stack cyclone they drop 15 per cent of the emissions which were contained in the original exhaust gas from the cupola. This last material separated is very fine particulate matter.

The waste gases are then exhausted through a 120-ft stack. The color of the smoke emitted is essentially white and is in reality steam which the hot gases form in passing through the water sprays. During the charging operation when the dust load of the gases is heaviest, the color of the

exhaust gas is very light gray or brown, but still lighter than the No. 1 scale on the Ringelmann smoke chart.

The collector, by removing 85 per cent or more of the emissions contained in the exhaust gas, and only passing material lighter in color than No. 1 on the Ringelmann smoke chart, meets all requirements for the stringent Indianapolis Air Pollution Code. In addition to this, the collector has removed all of the heavy particles which were considered a nuisance by the neighbors.

Good neighbor policy

This of course is of primary importance to the National Malleable as they want to be good neighbors.

The high stack tends to disperse the remaining 15 per cent of very fine particulate matter which is in the neighborhood of ten microns or less in size. The top ten feet of the stack is reduced from 36 in. to 32 in. in diameter, increasing the discharge velocity of the gases to about 3,000 fpm—equivalent to adding 30 additional feet to the stack.

The stack from the waste heat boiler attached to the pulverized coal-fired air heater has been connected to the collection system to eliminate another nuisance.

A good practice introduced in the foundry which helps eliminate air pollution is the cleaning of sprues and returns. When heavily coated with sand and charged into the cupola, they produce dust which is very hard to collect in any type of equipment. By removing this fine sand at the vibratory shakeout, this possible source of air pollution is eliminated.

Advantages of National Malleable's new air pollution control unit are:

1. The saving of coke alone will pay for this equipment over a period of ten years. The cost of the equipment installed is $175,000, and the annual coke bill is in the neighborhood of $200,000 per year. Present saving on coke is 15 per cent and this may increase with added experience in operation.

2. Melting rate has been increased 20 per cent. The original hot blast was 200 F and this has been increased to between 500 and 550 F.

3. Smoke and dust have been reduced by at least 85 per cent. This too will be improved as added experience in the operation of the new equipment is gained.

4. Before the equipment was installed, a cleaning crew had to clean the roof of the foundry at least twice a week. Since the equipment went into operation October 8, the cleaning crew has cleaned the roof only once—the last cleaning job for the roof. Neighbors in private residences within 50 feet of the plant, or across the street in the direction of the prevailing southwest wind, notice no dust from the foundry.

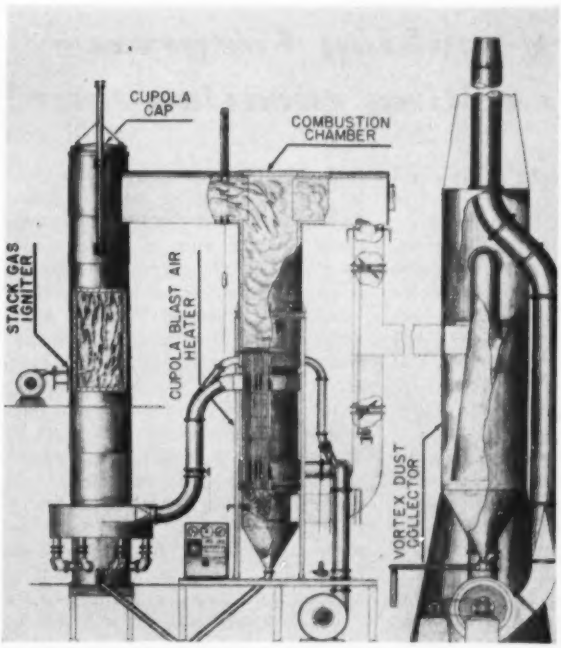
National Malleable & Steel Castings Co. has again proved to the community of Indianapolis that "The Foundry is a *Good* Place to Work."

▶ *Belgian founders association extends best wishes to A.F.S.*

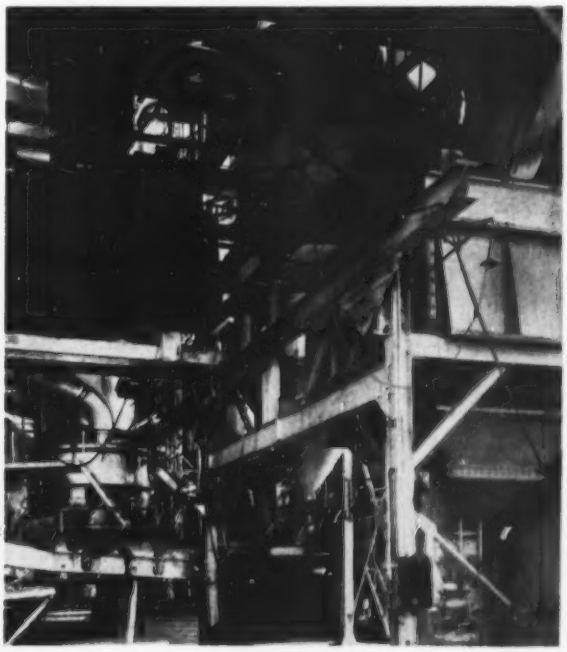
Best wishes for 1953 have been sent to all members of the American Foundrymen's Society by the Belgian Foundrymen's Association. Writing in reply to congratulations from A.F.S. President I. R. Wagner, Electric Steel Casting Co., Indianapolis, on his election to the presidency of the Association Technique de Fonderie de Belgique, J. F. Goffart, John Cockerill SA, Seraing, Belgium, said:

"I thank you very much for your kind letter conveying your congratulations about my election as general president of the Association Technique de Fonderie de Belgique. I am very glad to contemplate the assurance of meeting you during the International Congress in Paris next year.

"Meanwhile, I beg you to accept for yourself and for all the members of the American Foundrymen's Society my personal wishes and those from all the members of the Belgian Association for a good, happy, and prosperous year of 1953."



Principle construction details of typical cupola heat exchanger and gas cleaning system shown on opposite page.



In center background is the heat exchanger at National Malleable. 70 per cent of particulate matter drops into cone.

PARIS in '53

A history-making Congress—plus an exciting vacation tour!

■ American Foundry executives and their wives will converge on Paris from all parts of the U. S. for the International Foundry Congress to be held in the great French capital during the week of September 19-26. It will be an historic event for the U. S. delegation — the first official party to visit an International Foundry gathering in Europe in nearly a quarter of a century. For most of the group it will also mark either the beginning or the end of a memorable business holiday tour of England and Western [illegible].

The Congress itself [illegible] result of carefully co[illegible] arrangements made by [illegible] American Foundrymen's So[illegible] the French hosts of the [illegible] group, the *Association [illegible] de Fonderie de France*. [illegible] ses-[illegible] technical [illegible] plant visits—all give promise of the 1953 International proving to be one of the most brilliant yet conceived.

And to add incentive to interest, four exciting European tours have been arranged for American delegates—with itineraries and accommodations that should please the most discriminating of travelers at prices that should be a pleasant surprise to anyone familiar with travel costs.

Original planning was for only one pre-convention and one post-convention tour. Volume of early registrations made it clear that greater facilities should be provided.

The pre-convention Tour A is thus far proving to be one of the most popular, since it covers part of the usual summer vacation period.

All travel arrangements, other than those for plant visits [illegible] European foundries, have been made by the 60-year-old travel agency, Exprinter Travel Service. Reservations for the tour of one's choice (see following pages) should be made promptly—prior to March 31—with International Foundry Congress, North American Transportation Committee, Room 308, 500 Fifth Ave., New York, N. Y. Steamship space is limited and number of participants in each tour also must be adapted to host facilities in Europe.

Tour prices (see schedules) include first-class passage on trans-Atlantic steamers on basis of minimum rates. Accommodations rated higher than minimum will be sold at prevailing tariff differentials.

Land transportation will be by first-class rail or motor coach service. Gratuities and usual government taxes are covered by the tour

PRE-CONVENTION TOUR A

(49 days, 38 days in Europe—$1387)*

England—Belgium—Southern Germany and the Rhine—Switzerland and the Alps—Paris, Chateau Country

Aug. 18—NEW YORK: Leave on the *RMS Caronia* of the Cunard Line.

Aug. 25—SOUTHAMPTON: Meet tour director at Southampton and leave by special boat-train for London.

Aug. 26-31—LONDON: Visit Westminster Abbey, the Tower of London, St. Paul's Cathedral, the British Museum, Whitehall, the Cenotaph, Trafalgar Square, the Strand, Piccadilly, Buckingham Palace, Hyde Park. Drive through England's beautiful countryside via Oxford to visit Stratford-on-Avon.

Sep. 1-5—BRUSSELS: Leave by rail and channel steamer, via Dover and Ostend, for the short journey to the capital of Belgium. Visit the city by motor: the lower town with its Grand' Place and famous town hall (1402-1454) and splendid corporation buildings, the unusual "Manneken Pis" fountain, the impressive Palace of Justice, the Wiertz Museum.

Sep. 6—COLOGNE: By afternoon train into Germany for a tour of the famous Cathedral.

Sep. 7—THE RHINE: By rail to Coblenz for embarkation on Rhine steamer and trip to Wiesbaden, past the famous Lorelei.

Sep. 8-12—ZURICH: By day train, via the Black Forest and Basle, to this commercial metropolis of Switzerland. During stay, a sightseeing trip through the city itself and along the shores of Lake Zurich.

Sep. 13—LAKE OF LUCERNE AND RIGI: Travel by train to Arth Goldau, then ascend Rigi Eulm by funicular. Descend to Vitznau and continue by lake steamer to Lucerne.

Sep. 14—GRAND ALPINE TOUR: Leave *by motor* over the famous Axenstrasse drive into William Tell's Country; ascend into the high Alps via Furka Pass, the Rhone glacier, and Grimsel Pass to Interlaken.

Sep. 15—INTERLAKEN: Excursion to Lauterbrunnen Valley and the Trummelbach Falls in the Alps.

Sep. 16-17—MONTREUX AND GENEVA: Scenic trip by rail through the Bernese Oberland to Montreux on the shores of Lake Leman to visit the celebrated Castle of Chillon. On the next day, a trip on Lake Leman via Ouchy-Lausanne on the Swiss Bank and Evian on the French Bank, lunch in Geneva.

Sep. 18—PARIS: Arrive by afternoon train after trip across the wine-growing region of Burgundy.

Sep. 19-26—ATTEND INTERNATIONAL FOUNDRY CONGRESS: Meet old friends and new, participate in the business sessions, enjoy the mecca of travelers from all over the world with all its artistic and historic monuments, its centers of fashion and learning. Visit the great Louvre Museum, incomparable Notre Dame Cathedral, Sainte Chapelle, the Invalides and Napoleon's Tomb, and the Arch of Triumph—even the Latin Quarter of Montmartre will be on the itinerary. There also will be provision for that delightful trip through the wooded suburbs of Paris to the majestic Palace of Versailles and its gardens.

Sep. 27-29—CHATEAU COUNTRY: Three day motor excursion to the famous Loire Valley, spending two nights in Tours and visiting the historic Chateaux of Loches Chenonceaux, Azay-le-Rideau, Chinon and Langeais. Go via Orleans (of St. Joan of Arc fame) and return via Chartres, visiting its beautiful cathedral.

Sep. 30—PARIS: Day at leisure for last minute shopping and independent activities.

Oct. 1—CHERBOURG: By boat-train for embarkation homebound on the *RMS Queen Mary* of the Cunard Line.

Oct. 6—NEW YORK. Due to arrive.

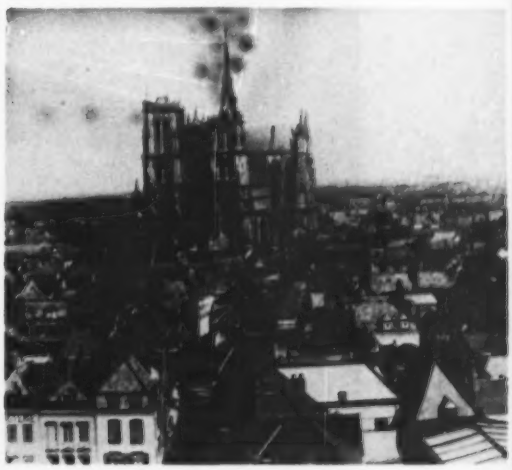
*All rates shown are for minimum-rate first-class accommodations on transatlantic steamships named.

fee. Transfer between points of arrival and departure en route is provided on the basis of two pieces of hand luggage per traveler.

Hotels have been carefully selected as to location and facilities with twin bedded rooms and private baths where obtainable. Continental breakfast and table d'hote dinners will be served at hotels and en route (except in London and Paris where breakfast only is provided). Sightseeing trips include service of an English speaking guide.

Fee does not cover visas, baggage insurance, gratuities aboard liners, port taxes ($13.00) or laundry, valet service, wines and other expenses of a purely personal nature.

A deposit of $200 is required to hold the trans-Atlantic accommodations involved—deposit is credited to tour fee. Here is an opportunity for American foundrymen which may never be offered again—wonderful ships enroute, beautiful Europe, at its Fall best, an International Congress in the most colorful city on earth, a chance to see modern European foundries and foundry methods, and the whole time spent with one's own friends—it's "Paris in '53" for foundrymen of America! (See following pages for itineraries of Pre-Convention Tour B and Post-Convention Tours C and D.)



PRE-CONVENTION TOUR B—$1325

(44 days, 35 days in Europe—$1225)*

Italy—Switzerland—France—Belgium—Holland—England

Aug. 28—NEW YORK: Leave on *S. S. Liberte* of the French Line.

Sep. 3-4—PARIS: Meet tour director at Le Havre and leave by special boat-train for Paris, mecca of travelers from all over the world.

Sep. 5-7—ROME: Arrive in the afternoon for a comprehensive program of sightseeing throughout the "Eternal City." Visit St. Peter's Basilica and see the famous art collections of the Vatican; visit the Basilica of St. John in Lateran—and the Borghese and Pincio Villas, for a beautiful view of Rome.

Sep. 8—THE HILL TOWNS: All-day motor trip through the Apennines to the beautiful hill towns of Assisi (birthplace of St. Francis) and Perugia, with its Etruscan gate.

Sep. 9—FLORENCE: Tour Tuscan "City of the Renaissance," one of the most important tourist centers in Europe, center of Italian art and culture. Visit the many monuments of the Medici, the beautiful Cathedral, the Belfry by Giotto.

Sep. 10-12—MILAN: By morning train, arriving at noon. Half-day tour of this important industrial city, including a visit to the Cathedral to see the famous painting "The Last Supper".

Sep. 13-15—ZURICH: By rail via the Italian Lake Region and through the St. Gothard Tunnel, arriving in the afternoon. Half-day visit of this important commercial metropolis, beautifully situated on the Lake of Zurich.

Sep. 16-17—MONTREUX AND GENEVA: One-day excursion via Berne to Montreux, on the shores of Lake Leman, to visit the celebrated Castle of Chillon.

Sep. 18—PARIS: Leave by train for trip across the wine-growing region of Burgundy to Paris.

Sep. 19-26—ATTEND INTERNATIONAL FOUNDRY CONGRESS: During stay in Paris there will be excursions to the great Louvre Museum, incomparable Notre Dame Cathedral, Sainte Chapelle, the Invalides and Napoleon's Tomb, and the Arch of Triumph—plus a visit to the Latin Quarter of Montmartre.

Sep. 27-29—BRUSSELS: Leave by luxurious "North Star Express" for the capital of Belgium, the "little Paris". Tour the city by motor—the lower town with Grand' Place and famous Town Hall (1402-1454) and splendid corporation buildings, the unusual "Manneken" fountain, the impressive Palace of Justice, the Wiertz Museum.

Sep. 30-Oct. 1—AMSTERDAM: By morning train to the Dutch capital, with its attractive architecture, famous Rijks Museum of Rembrandt masterpieces, and picturesque winding canals. Thence by boat to the Island of Marken to visit a quaint fishing-folk village. Then by evening service, via Hook of Holland, for steamer trip across the North Sea.

Oct. 2-5—LONDON: Arrive in Harwich early and then on to the British metropolis. During stay, visit Westminster Abbey, the Tower of London, St. Paul's Cathedral, the British Museum, Whitehall.

Oct. 6—SOUTHAMPTON: Special boat-train to Southampton and sail on *S.S. Ile de France* of the French line.

Oct. 13—NEW YORK: Due to arrive.

PRE-CONVENTION TOUR C

(49 days, 38 days in Europe—$1398)*

Switzerland—Germany—The Black Forest—the Rhine—Paris, the Chateau Country—Belgium—Holland—England

Sep. 1—NEW YORK: Leave on *R.M.S. Mauretania* of the Cunard Line.

Sep. 8-9—PARIS: Meet tour director at Cherbourg and leave by special boat-train for Paris, mecca of travelers from all over the world.

Sep. 10—INTERLAKEN: Leave by morning train to visit this delightful village at the foot of the mighty Jungfrau—plus a half-day excursion to the Lauterbrunnen Valley and the Trummelbach Falls.

Sep. 12—GRAND ALPINE TOUR AND LUCERNE: Travel by motor into the high Alps via Grimsel Pass, the Rhone Glacier, and then descend into William Tell's country for a drive over the famous Axenstrasse to Lucerne.

Sep. 13-15—ZURICH: Leave by steamer on the Lake of the Four Forest Cantons for trip to Vitznau. Ascend to Rigi Kulm by Funicular, and descend on the other side to Arth Goldau. By rail to Zurich.

Sep. 16—WIESBADEN: Leave by morning train for trip, via Basle and the Black Forest.

Sep. 17—THE RHINE: Leave by steamer for trip down the Rhine, past Lorelei Rock and ancient feudal castles, to Coblenz—then by rail to Cologne, visit its lovely cathedral.

Sep. 18—PARIS: By afternoon train, back to the gay French capital.

Sep. 19-26—ATTEND INTERNATIONAL FOUNDRY CONGRESS: During stay in Paris, besides opportunity to participate in the business sessions, there will be excursions to artistic and historic monuments and to centers of fashion and learning—visit to the great Louvre Museum, incomparable Notre Dame Cathedral, Sainte Chapelle, the Invalides and Napoleon's Tomb, and the Arch of Triumph—plus a tour of the Latin Quarter of Montmartre.

Sep. 27-29—CHATEAU COUNTRY: Leave for a three day excursion to Valley of the Loire. Visit the famous Chateaux of Langeais, Azay-le-Rideau, Chinon, Chenonceaux. The outward trip is via Orleans famed for its associations with Joan of Arc and the return via Chartres.

Sep. 30—PARIS: Day at leisure for shopping and independent activity.

Oct. 1-5—BRUSSELS: Leave by the North-Star Express for the Belgian capital. Tour the city by motor—the lower town with Grand' Place and famous town hall (1402-1454) and splendid corporation buildings, the unusual "Mannekin Pis" fountain, the impressive Palace of Justice, the Wiertz Museum.

Oct. 6-8—AMSTERDAM: Leave by rail for Amsterdam for a half-day visit of the city with its attractive architecture and famous Rijks Museum of Rembrandt masterpieces.

Oct. 9—LONDON: Crossing the North Sea by day service, via Hook of Holland, and then transferring to hotels in London. During stay, group will visit Westminster Abbey, the Tower of London, St. Paul's Cathedral, the British Museum, Whitehall, the Cenotaph, Trafalgar Square, the Strand, Piccadilly, Buckingham Palace, Hyde Park. On one day there will be a drive through England's beautiful countryside via Oxford, to visit Stratford-on-Avon and the surrounding Shakespeare country.

Oct. 15—SOUTHAMPTON: Leave by special boat-train for Southampton and then embark on *R.M.S. Queen Mary* of the Cunard Line, for voyage home.

Oct. 20—NEW YORK: Due to arrive.

POST-CONVENTION TOUR D

(57 days, 45 days in Europe—$1520)*

Paris—The French Riviera—Italy—Switzerland—Black Forest and the Rhine—Brussels—England

Sep. 9—NEW YORK: Leave on *S. S. Ile de France* of the French Line.

Sep. 16-18—PARIS: Meet tour director at Le Havre and leave by special boat-train for Paris where there will be excursions to the great Louvre Museum, incomparable Notre Dame Cathedral, Sainte Chapelle, the Invalides and Napoleon's Tomb, the Arch of Triumph, and the Latin Quarter and Montmartre. There also will be a delightful trip through the wooded suburbs of Paris to the majestic Palace of Versailles and its gardens.

Sep. 19-26—ATTEND INTERNATIONAL FOUNDRY CONGRESS in Paris and participate in business sessions.

Sep. 27-28—NICE AND THE RIVIERA: Leave by day train for journey across the wine growing regions of Burgundy and down the valley of the Rhone to Marseilles. Thence along the beautiful French Riviera to Nice, France's famed Mediterranean resort, where group will spend two nights. During stay there will be opportunity for a spectacular motor excursion over the Grande Corniche with its incredible panoramas, descending to Menton and returning via the lower route past famous Monte-Carlo and its Casino, the tiny principality of Monaco, and the picturesque port of Villefrance.

Sep. 29-Oct. 1—FLORENCE: Leave by Motorcoach along the Rivieras to Genoa and continue by rail to Florence, "City of the Renaissance" and one of the most important tourist centers in Europe. Tour will visit the many monuments of the Medici, the beautiful Cathedral, the famed Belfry by Giotto, the art galleries of the Uffizi and Pitti Palaces, Dante's House.

Oct. 2—THE HILL TOWNS: All-day motor trip through the Apennines to the beautiful hill towns of Perugia, with its Etruscan gate, and Assisi, the birthplace of St. Francis.

Oct. 3-5—ROME: A comprehensive program of sightseeing will include trips to St. Peter's Basilica, the Vatican, the Basilica of St. John in Lateran, and the Borghese and Princio Villas (for a beautiful view of Rome and its seven hills), the Colosseum, St. Paul-Outside-the-Walls, the Catacombs, the ancient Appian Way, the Chapel of Quo Vadis.

Oct. 6-7—VENICE: Leave by rail for Venice. Transfer by gondola to a canal-front hotel. Then on foot around St. Mark's Square and by gondola through the network of canals past marble palaces, the Rialto Bridge and picturesque markets. There will also be visits to the islands of Murano and Burano to see the glass blowing and lace factories there.

Oct. 8-10—MILAN: The great industrial city. Arrive by rail for half-day tour of the city including a visit to the Cathedral with its famous painting "The Last Supper".

Oct. 11-12—LUCERNE: By rail through the Italian Lake region and the St. Gothard Tunnel to Lucerne, the heart of Switzerland. Excursion by steamer on the Lake of Four Cantons to Vitznau, thence by funicular to Rigi-Kulm and return.

Oct. 13-16—ZURICH: Arrive after a 90-minute train ride from Lucerne. Spend a half day visiting the city.

Oct. 17—WIESBADEN: Leave by rail via Basel and the Black Forest for Wiesbaden, famous resort town.

Oct. 18—THE RHINE: Leave by steamer down the Rhine to Coblenz, past the Lorelei Rock and many feudal castles. Continue by rail to Cologne with its famous Gothic Cathedral.

Oct. 19—COLOGNE: Side trip by car through the Ruhr Valley—through Essen, Dusseldorf, and other towns and villages.

Oct. 20-23—BRUSSELS: Leave by morning train to the capital of Belgium. Visit the city by motor; the lower town with its Grand' Place, the famous town hall (1402-1454) and splendid corporation buildings, the unusual "Manneken Pis" fountain, the impressive Palace of Justice, the Wiertz Museum.

Oct. 24-29—LONDON: Leave by day service via Ostend and Dover to London, heart of the British Commonwealth of Nations. During stay, group will visit Westminster Abbey, the Tower of London, St. Paul's Cathedral, the British Museum, Whitehall, the Cenotaph, Trafalgar Square, the Strand, Piccadilly, Buckingham Palace, Hyde Park. One day will be devoted to tour of England's beautiful countryside via Oxford to visit Stratford-on-Avon.

Oct. 30—SOUTHAMPTON: Special boat-train to Southampton for embarkation on *S. S. Liberte* of the French Line and voyage home.

Nov. 5—NEW YORK: Due to arrive.

Effect of liquid metal temperature on

Grain size of high manganese steel

S. L. GERTSMAN / *Head, Steel & Steel Castings Sec., Dept. of Mines & Technical Surveys, Ottawa, Ont.*

This brief report throws light on the controversy concerning influence of liquid metal temperature on Hadfield's manganese steel. The paper, prepared for presentation at the last All-Canadian Foundry Conference, is published by permission of the Director-General of Scientific Services, Department of Mines & Technical Surveys, Ottawa, Ont.

■ Producers of Hadfield's manganese steel—normally 1.0-1.4 per cent carbon and 10.0-14.0 per cent manganese—have observed that when poured hot, the steel is coarse grained and much more susceptible to cracking than ordinary steels. The cracking is, of course, greatly influenced by the higher shrinkage characteristic associated with manganese steel. Coarse grain, however, as will be shown has an effect on cracking.

A series of controlled experiments was carried out to determine whether the final grain size was due to the amount of superheat in the furnace on melting or simply the result of the temperature at which the metal was poured.

Pour test heats

Ten-pound heats of manganese steel were produced in a high frequency induction furnace. The melting stock used and the additions which were made were carefully controlled so that the final analyses of the metals were within a relatively close range. Temperatures were obtained with an immersion Pt-PtRh thermocouple sheathed in fused silica tubes. This thermocouple was connected to a high speed temperature recording instrument. The metal was poured into a mold containing a 0.505-in. diameter tensile test bar cavity. Standard precision casting technique was used so that the tolerances of the bar were ±0.003 in.

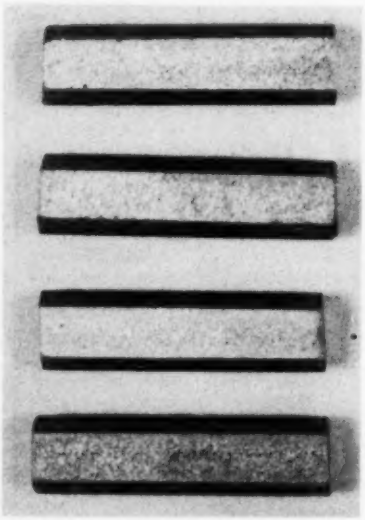


Fig. 1 . . . All specimens are fine-grained when poured at same temperature (2606 F). Melting temperatures were, from top down, 2732 F, 2912 F, 3092 F, and 3272 F.

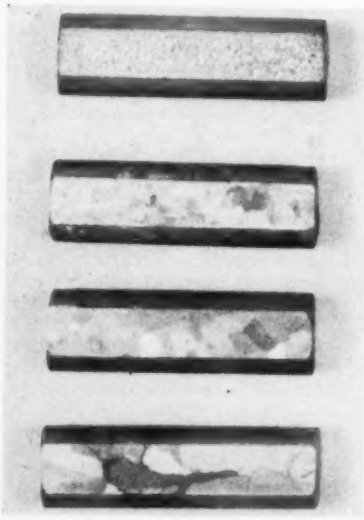


Fig. 2 . . . Grain size increased with pouring temperature for specimens melted at 3272 F. Pouring temperatures, top down, were 2732, 2912, 3092, and 3272 F.

The molds were at 1200 F when the metal was poured.

The bars were all ground flat to a similar depth from the surface. They were then etched in 1:1 HCl at 165 F for a sufficient time to clearly reveal the grains.

Figure 1 illustrates the results obtained when the maximum temperature achieved during melting was varied and the pouring temperature was kept constant at 2606 F. The specimens are all fine grained regardless of the temperature of superheat in the furnace.

Figure 2 shows the effect on grain size when the melting superheat temperature was kept constant at 3272F while the pouring temperature was varied. A very fine grain is obtained with a pouring temperature of 2732 F. As the pouring temperature is increased, the grains grow larger and larger. Therefore, pouring temperature has a direct influence on grain size of manganese steel. This is probably due to a variation in cooling rate of the solidifying metal.

It is interesting to note that the coarse grained specimen produced by the highest pouring temperature (3272 F in Fig. 2) has cracked around some of the grain boundaries. This indicates that coarse grained steel is more susceptible to cracking than fine grained steel.

▶ *Set patternmaker book price*

Price of the new *Patternmaker's Manual* is $4.50 to A.F.S. members, $6.75 to others.

S & H & AP contributions

Help expand safety training program

■ Importance of the current three-year A.F.S. drive for $350,000 fund to finance a 10-year Safety, Hygiene and Air Pollution Program is evidenced in the growing interest foundrymen are showing in the stepped-up S & H & AP activities in safety training.

Typical of the many such activities sponsored by the S & H & AP Committees are the intermittent conferences on safety, hygiene and air-pollution problems such as the one held this month at the University of Illinois (February 17-19). Such conferences, held at various universities throughout the country, present the information accumulated at each in book form for the benefit of the industry at large as well as for the participants in the program.

Next in the series of such programs is the Foundry Safety and Health Conference, which is to be held on March 24 and 25 at The University of Wisconsin, Madison, Wis. (See Program on page 50.)

Cooperating with A.F.S. in conduction of the Conference are the University's College of Engineering, the University Extension Division, and the Medical School as well as the Wisconsin Board of Health, the Industrial Commission of Wisconsin and the Wisconsin Chapter of A.F.S.

The Conference has been planned for supervisors, industrial nurses, personnel managers, and administrative and executive personnel of the foundry industry who are interested in the well-being of their employees as well as in good foundry practice. The program has been organized so that it will be of value to both large and small operations.

Purpose of this and other such conferences is to acquaint foundrymen with the latest developments and modern trends in Safety and health protection practices in foundry operations.

Enrollment should be made at once for the Wisconsin Conference by writing to the Extension Division, University of Wisconsin, Madison, Wis. A fee of $15 should accompany each application. This fee covers the cost of the course and materials but not room or meals.

All sessions will be held in the Memorial Union Building, located near the end of State Street at Park in Madison. A certificate will be issued to each person, regularly enrolled, who attends all sessions and satisfactorily completes the course.

More safety training

Another important S & H & AP development has been the introduction of training courses on fundamentals of foundry safety. The latest of these courses was conducted on January 15 and 16, at the Sherman Hotel in Chicago. Representatives from 18 foundries attended.

Introduced in the Chicago area on an experimental basis, it is now apparent that supervisors from individual foundries profit a great deal from such courses. Plans are being made for similar programs to be given under auspices of A.F.S. Chapters throughout the country.

Additional S & H & AP services are being offered in the new series of manuals on recommended practices now being developed. Latest of these to be made available are *Health Protection in Foundry Practice* and *Symposium on Air Pollution.*

The list of foundries contributing to the support of such activities through the S & H & AP Fund continues to grow. Last month a complete listing of contributors (to date) was presented in the January issue (Page 59) of AMERICAN FOUNDRYMAN. Since that time (up until January 25) the following companies

Using charts to illustrate his point, Theodore Kracklow, Deere & Co., Moline, Ill., speaks to foundry supervisors who attended recent A.F.S. safety training course.

Foundry Safety and Health Protection Conference

University of Wisconsin—March 24, 25

TUESDAY, MARCH 24, 1953

8:30 a.m. . . LATE REGISTRATION.

9:00 a.m. . . Introduction: E. B. Fred, President, The University of Wisconsin, Madison.

9:15 a.m. . . *"Study of Metal Fume Hazards in Wisconsin Foundries,"* Wm. L. Lea, Wisconsin State Board of Health, Madison, Wisconsin.

10:30 a.m. . . *"Dust Hazards—Control (Nature of Disease caused by Dust)"* Dr. O. A. Sander, Industrial Medical Consultant, Milwaukee.

11:15 a.m. . . *"Air Pollution—Inside and Outside the Foundry"* John M. Kane, American Air Filter Co., Louisville, Ky.

12:00 noon. . . LUNCH

1:30 p.m. . . *"Pulmonary Function and Aluminum Therapy,"* Dr. J. W. G. Hannon, McIntyre Foundation, Washington, Pa., and Dr. R. C. Emmons, University of Wisconsin, Madison.

3:00 p.m. . . *"Radiation Hazards in Testing—Cobalt 60 and X-Ray Demonstration,"* Professor Geo. J. Barker, University of Wisconsin.

3:30 p.m. . . *"Practical Housekeeping Hints for the Job and Production Foundry,"* E. O. Jones, Belle City Malleable Iron Co., Racine, Wis., and Clayton Orcutt, The Falk Corporation, Milwaukee.

6:30 p.m. . . DINNER MEETING: Rose Bowl Game of 1953.

WEDNESDAY, MARCH 25, 1953

8:30 a.m. . . *"The Industrial Commission's Interest in Industrial Health and Safety,"* Voyta Wrabetz, and/or O. T. Nelson, both of the Industrial Commission of Wisconsin, Madison.

8:45 a.m. . . *"The Supervisor's Responsibility in Maintaining Safe and Healthful Foundry Practices,"* W. N. Davis, American Foundrymen's Society, Chicago.

9:45 a.m. . . *"Foundry Eye Hazards,"* Dr. E. H. Westland, American Optometric Assn.

10:30 a.m. . . PANEL DISCUSSION: *"Safety and Health Hazards and Prevention—Sand Handling, Coremaking & Molding, Scrap and Material Handling, Melting and Pouring, Shakeout and Core Knockout, Cleaning — Chipping — Grinding."* Joseph Risney, Risney Foundry Equipment Co., Wauwatosa, Wis., Chairman.

12:00 noon: LUNCH

1:00 p.m. . . *"Safety and Health Hazards in Shell Molding Process,"* W. S. Walters, La Grange Shell Molders, Inc., La Grange, Ind.

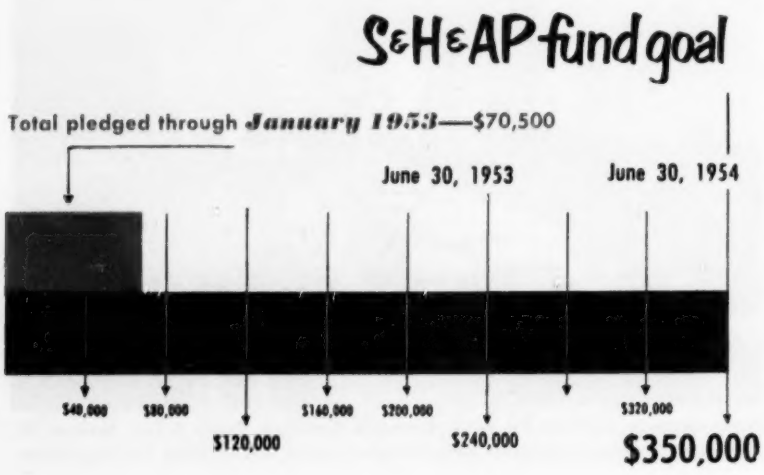
1:45 p.m. . . SAFETY SKIT: Gene Dopp, International Harvester Co., Milwaukee, Wis.

2:30 p.m. . . *"Electrical Hazards,"* Raymond Bonneau, Inland Steel Co., Indiana Harbor, Ind.

3:15 p.m. . . *"The Medical Aspect of Industrial Noise,"* Dr. Meyer F. Fox, Mt. Sinai Hospital, Milwaukee, Wis.

4:00 p.m. . . *"The Legal Aspect of Industrial Noise,"* Harry A. Nelson, Industrial Commission, Milwaukee.

5:00 p.m. . . PRESENTATION OF CERTIFICATES: M. O. Withey, Dean, College of Engineering, The University of Wisconsin, Madison.



have added their contributions to the fund:

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Associated Foundries Ltd., Vancouver, B.C., Canada
Duncan Foundry & Machine Works, Inc., Alton, Ill.
Forano Ltd., Plessisville, P. Q., Canada
Ford Motor Co., Dearborn, Mich.
Foundry Equipment Co., Cleveland.
Headford Bros. & Hitchins Foundry Co., Waterloo, Iowa
Kondu Manufacturing Co., Ltd. Preston, Ont., Canada
Maytag Co., Newton, Iowa
Minneapolis-Moline Co., Hopkins, Minn.
Thos. Paulson & Son, Inc., Brooklyn, N. Y.
Pekin Foundry & Manufacturing Co., Pekin, Ill.
Peoria Malleable Castings Co., Peoria, Ill.
Sterling Foundry Co., Wellington, Ohio
Sundstrand Machine Tool Co., Rockford, Ill.
Swedish Crucible Steel Co., Detroit.
Webster Manufacturing Inc., Tiffin, Ohio
Wisconsin Grey Iron Foundry Co., Milwaukee, Wis.

▶ *On cost of reducing incidence of lead intoxication cases*

An ounce of prevention is not only better than a pound of cure—it costs less. At least that is what officials of the American Brake Shoe Co. have determined after a long-term program aimed at preventing occurrence of lead intoxication.

While a few cases of lead intoxication still occur, it is reported that incidence in company's plant where the problem was greatest has been reduced by more than 85 per cent—the cost per case from $92.40 a few years back to $10.78 in a recent year.

Is the cost of such a successful prevention program beyond the means of smaller foundry operations? Wm. B. Given, Jr., chairman of the board at American Brake Shoe believes it is not.

"Out of our experience," Mr. Given, points out, "we believe that a plant employing 100 people could have an effective program for a cost of approximately $27 per employee per year—or 1½ cents per man hour. This would include part-time services of a doctor and a nurse and taking advantages of the free services of state and local agencies in industrial hygiene programs."

Washburn cores disinterred

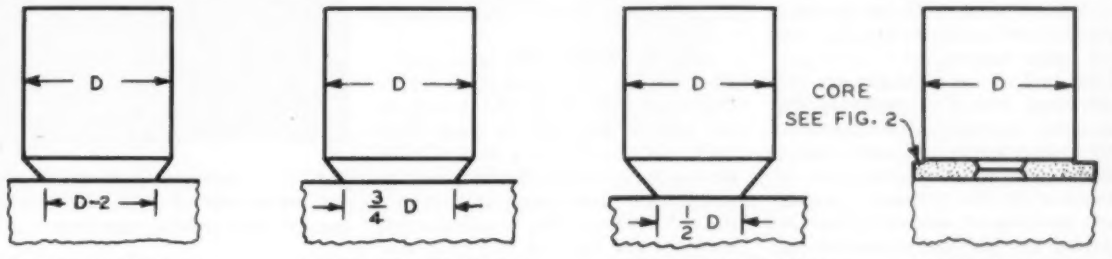
Pros and cons of necked down risers

J. B. CAINE / *Consultant, Wyoming, Ohio*

Writing much as he talks . . . using the style the author has made popular through his technical presentations and discussions of technical papers . . . J. B. Caine reviews the advantages and limitations of necked down risers. He recognizes only two real objections to these cleaning-room time savers and doesn't take either of them too seriously.

■ It's funny how foundry processes and thinking go thru cycles, cycles that can almost be called fashions. Take necked down risers for example. The principle of decreasing the riser contact area (Fig. 1) that must be sawed, broken, or flame cut and then often ground is far from new. E. C. Washburn patented the principle way back in 1908. It must have created quite a stir at that time, for the wafer cores used in this principle are still known as Washburn cores. It then lay dormant for about 35 years. Why? No one knows exactly, other than these necked down risers, proportioned as recommended by Washburn never seemed to function consistently.

It is certain that this principle of necking down the riser contact was not dropped because the advantages were not worth while. This principle is one of a half dozen or so basic principles that offer real economic savings to the foundry. Removing risers by flame cutting or sawing, and grinding the riser contacts are the most expensive operations in the foundry. It costs about 7 cents a square inch to flame cut a steel riser and grind the contact smooth. An 8-in. diameter riser therefore costs about $4 to flame cut and grind the full 50-sq. in. contact. If the contact is irregular, requiring more than one cut, the cost easily doubles. The contact can be decreased to as little as 4 sq. in., the removal cost decreased over 90 per cent with a necked down core. If the riser is



RISER NECKED IN 1 IN. (ALL METALS)

RISER NECKED DOWN TO $\frac{3}{4}$ OF FULL SECTION (ALL METALS)

RISER NECKED DOWN TO $\frac{1}{2}$ OF FULL SECTION

SMALLEST PRACTICAL CONTACT (STEEL)

DECREASE IN AREA OF CONTACT AND SAVINGS

Riser Diameter in.	Sq. in.	Saving per riser @ 3½¢ per sq. in. (grinding only)	Sq. in.	Saving per riser @ 3½¢ per sq. in. (grinding only)	Sq. in.	Saving per riser @ 3½¢ per sq. in. (grinding only)	Sq. in.	Saving per riser @ 7¢ per sq. in. (cutting & grinding)
2	—	—	1.4	.05	—	—	2	.14
4	9	.32	5.4	.19	9	.32	11	.77
8	22	.77	22	.77	37	$1.30	47	$5.40
12	35	$1.22	49	$1.72	85	$2.98	100	$7.00
20	60	$2.10	137	$4.78	236	$8.25	300	$21.00

Fig. 1 . . . Effect of riser contact area on cleaning costs. Sketches are for top risers and are to scale for 8 in. diameter risers. Side risers can be necked down just as well as top risers, but contacts should be slightly larger than above.

broken off, as is usual in gray and malleable iron, just the decreased grinding will result in about half the savings quoted. Comparable savings are possible in sawing if the neck can be kept free of sand.

It is not necessary to have elaborate core boxes to effect real savings in cutting and grinding. A decrease of just an inch, or so in the diameter, or section of the riser means real savings (Fig. 1).

Explains results

One reason why inconsistent results were troublesome in production when necked down risers were used was found in 1945 thru work of the Research Committee of the Steel Founders' Society of America. The area of contact thru the necked down core must change greatly with just minor variations in core thickness. This relation can be summarized for steel in a chart such as shown in Fig. 2, as reported by Briggs[1] and Hall[2]. Note that the core thickness (distance from casting to riser) is plotted against square inches of contact. This means that the contact can be any shape to suit the casting. The troubles arising from arbitrary selection of the core thickness and size of contact are evident. If the contact is rectangular, its area must be more than doubled if the core thickness is increased from ½ in. to ¾ in. This same relation exists for all shapes of contacts and core thicknesses, but to a lesser degree.

Figure 2 can be used directly only with steel, but it is probable that the ratios between core thicknesses and contact areas are quite close to those required for other metals. Although a number of basic properties, such as rate of heat transfer and pouring temperature differ for each metal, these differences tend to cancel out. One advantage favorable to the metals poured at lower temperatures than steel is that the core thickness can be kept at a minimum. The slope of the lines in Fig. 2 indicates that details do not have to be watched too closely with thin cores. The lines are almost horizontal when the core thickness is less than ⅜ in.

This research work led to a renaissance of necked down risers in the steel foundries in the late 1940's. Foundries casting other metals remained in the dark ages as far as Washburn cores were concerned. Lately there has been a gradual decrease in their use. Why? Again, nothing definite, just vague complaints of troubles. One that is almost universal is that of the cores dropping when nailed in the cope. OK, OK, so they do drop. But how are they fastened? Nailed haphazardly in the usual foundry way? The point that seems forgotten is that the savings in riser removal will pay for a lot of care in core setting. The cost department may throw a fit if anyone suggests allowing a few cents to set a core. But an extra penny or two spent here can save dimes and dollars in the cleaning room.

Frankly, this limitation boils down to the fact that core drops show up on the scrap sheet. Thousands of extra riser removal dollars do not. What a way to run a business!

Can't answer this one

A similar complaint has to do with necked down risers not allowing eroded and spalled sand to float up in the risers. This one is unanswerable from the technical standpoint. Then too other foundrymen must be luckier than the writer has been in this floating business. The only answer to this is a change in mental attitude. Look over Fig. 1, use any value you wish for cutting and grinding cost, and see if it is worth some time and money on gating and sand research to find out how to keep sand in place. Then it won't have to be floated out. Sand can be kept in place, but not with a magic wand.

Ditto for blows. The open hearth steel fellows have part of a leg to stand on here. How about settling for part of the pot? A mold filled with cold metal from a 20-ton ladle, thru a 3-in. nozzle fills fast and the mold cavity gases must get out in a hurry. Perhaps the smallest riser necks cannot be used, but remember —the most square inches are in the outer inch of a riser.

If the minimum riser contact cannot be used, why not reduce the contact by an inch, or so? Just reducing the radius, or section of a riser by one inch, or by a quarter, appreciably decreases the contact area. This can be done without cores, if done correctly. Again, a few cents to the molder to do a good job ramming this neck, for it must be hand rammed. Cut the proper taper on the riser pattern, it cannot be cut by hand using an old nail keg, or milk bottle as a riser pattern. Again a matter of economics, with the odds in favor of doing the work in the foundry and pattern shop, not in the cleaning room.

One complaint that has some basis in fact is that of hot tearing some castings in some metals. This difficulty cannot be blamed directly on necked down risers, it's a matter of hot spots and temperature gradients. The writer has experienced cases of chronic hot tearing at riser contacts eliminated with necked down cores. It depends on the casting, cores, gates and a dozen other variables. If the hot spot of the reentrant angle forming the neck is causing the hot tear, why not try reducing just the unrestrained side of the riser and fillet the restrained side? Rarely are both sides of a riser hindering contraction.

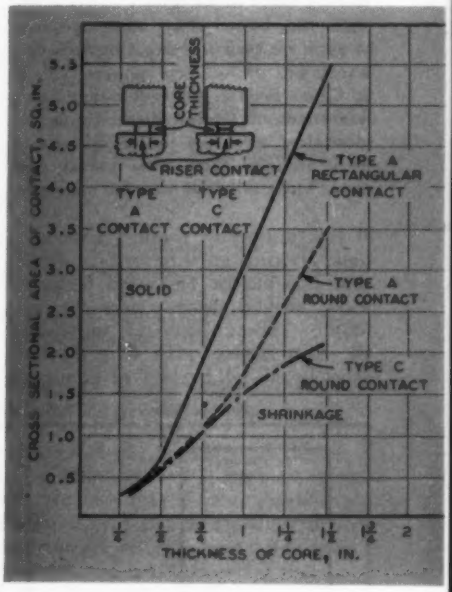


Fig. 2 . . . Influence of shape, height, and cross-sectional area of riser contact on steel casting soundness.

Probably the most universal complaint regarding necked down risers is still "spotty" shrinkage. Just the very name "spotty" should make one suspicious of blaming the necked down principle. Solidification shrinkage is a physical constant of the metal and is unvariant. It just doesn't come spotty. You either have it all the time, or you don't.

If it is certain that all castings do not show shrinkage and that the dimensions of the riser and contact are constant, this variation in shrinkage must mean that something else is wrong. The chances are that there is a freeze-off somewhere in the riser and the trouble is faulty application of atmospheric pressure. This is true for all metals.

If spotty shrinkage is encountered in a casting made with necked down risers it will pay to analyze the trouble before discarding the principle and increasing cleaning room cost. First, be sure the shrinkage is spotty. One legitimate objection to this principle of riser neck down is that it sometimes hides the shrinkage. Instead of the shrinkage area showing up at the riser contact, it will occur in the casting ¼ to 1 in. away from the contact. If shrinkage is found in all castings, a legitimate limitation to necked down risers is probable. More about this later.

Probably the most common cause of spotty shrinkage is that something has loused up atmospheric pressure in the riser itself. This applies to three of the ferrous metals and probably applies to all metals. Just going through the motion of putting an atmospheric pressure core in a blind riser, or a dab of pipe eliminator on an open riser does not insure application of atmospheric pressure to the riser until it is completely solid. A necked down riser contact by its basic function must impose a severe hot spot. If the riser freezes over and a vacuum tends to form, an atmospheric break through can occur in the riser neck and extend into the casting. In fact the casting can feed the riser. Whether such risers will feed properly depends on almost pure chance. A grain of sand is all that is necessary sometimes for the continued application of atmospheric pressure to the liquid interior of the riser. The absence of this grain of sand can mean shrinkage.

When necked down risers are used the atmospheric pressure core in the riser must work. Pipe eliminator must be applied to open risers in time and in sufficient quantity so that the riser does not freeze over until the casting is completely solid.

There are other defects encountered with necked down risers that can be overcome with a little care and patience in the foundry. It seems that the core room will always make necked down cores of sand bonded with oil and cereal alone unless watched. A peculiar type of scab-like elevation outlining the riser periphery results. Include in these cores something that does not burn out like silica flour, clay, and iron oxide. These cores get hot!

Another exasperating defect appears to be blows in the metal surfaces in contact with necked down cores. Some of these surface depressions are blows, for these wafer cores must be vented and many times are not. In most cases these seeming blows are actually surface shrinkage. It is not too well appreciated that in most castings the necked down core itself is the last part of the riser-casting system to cool below the freezing range of the metal. The cure is thicker cores, to move the hot spot into the riser itself and separate the casting from the riser sufficiently to get directional solidification from the casting, through the restricted opening to the riser.

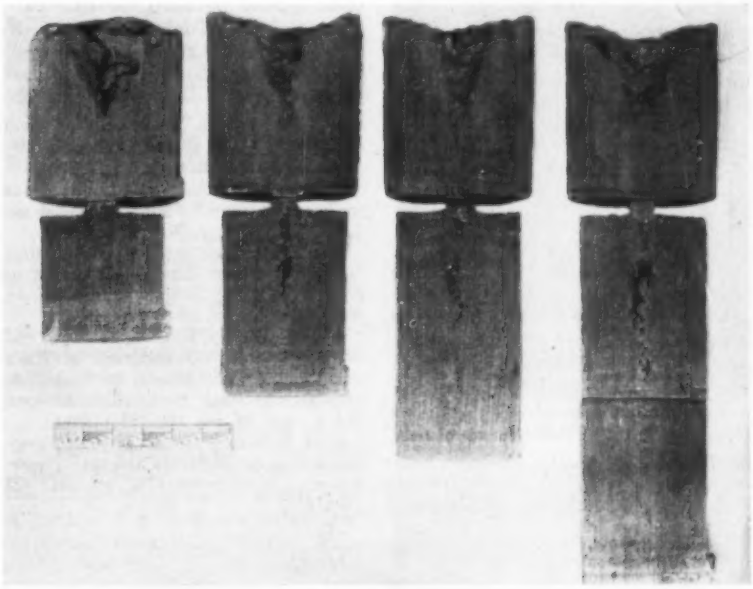


Fig. 3 . . . Ability of riser to feed castings of various sizes. Risers are all 5 in. in diameter and 6 in. high. Neck diameter is ⅞ in., height is ½ in. Castings are all 4 in. in diameter and 4, 6, 8, and 12 in. long.

There are two legitimate limitations to necked down risers—long feeding distance and segregation. These two limitations have been partially investigated, reported, and then promptly buried in the *A.F.S. Transactions*. Most everyone seems to have forgotten about them. It is time to disinter them. Within a year or so after publication of Fig. 2, Brinson and Duma[3] published data showing that shrinkage will occur with necked down risers as the feeding distance increases. An example taken from Brinson and Duma's paper is shown by Fig. 3.

Need feeding range studies

The story is not as bad as it seems from Fig. 3. The feeding distance for steel shown in Fig. 3 with necked down risers is only one times the section thickness, versus about 6 √Thickness when a full riser contact is used[4]. It is probable that the feeding distance with necked down risers increases as the section to be fed becomes less chunky than these test castings. Millions of production castings have been fed sound in steel using necked down risers when the feeding distance was 5 to 10 times the section thickness. More work should be done to establish the feeding range of necked down risers at different surface area-volume ratios.

A particularly difficult situation to diagnose occurs in production when a combination of too long feeding distance and a riser of insufficient section is encountered. Both these errors result in exactly the same type of shrinkage. In steel, shrink voids occur like those shown in Fig. 3, just away from the riser junction. With metals prone to more dispersed shrinkage than steel this combination is even more confusing. The only method of differentiation known to the writer is to make castings, with and without necked down risers, radiograph, or thoroughly section the castings to be sure the shrinkage is not missed. If shrinkage is found in all castings fed with necked down risers and no shrinkage when full contacts are used, there is a legitimate reason for using a full riser contact, or in some instances, increasing the riser contact with pads.

As discussed by Brinson and

Duma, very thin necked down cores make possible the use of small riser contacts with long feeding distances. These thin wafer cores are usually impractical in steel practice (they get too hot and distort) but can be used more successfully with the lower melting point metals.

A similar procedure must be used to diagnose a possible combination of too small riser section and incorrect riser neck proportions.

Another limitation of necked down risers has been reported by Bishop and Fritz[5]—segregation—as shown in Fig. 4. This segregation must be related to the shrinkage reported by Brinson and Duma, for it also varies with the size of contact, core thickness and feeding distance (Fig. 5). This phenomenon has been investigated only for steel. It's anyone's guess what happens in other metals. This limitation is also not as serious as it may seem. First, segregation is not confined to necked down risers; it is more common than is generally believed. On the other hand, segregation does not occur with all necked down risers. More investigational work is needed. Some segregation, with an increase in carbon content of 0.10 per cent, or so, is not too serious in medium carbon and low alloy steels, used in the annealed or normalized state. This segregation becomes serious in machining if the castings are liquid quenched, especially if quenched to high hardness levels. It cannot be tolerated in highly stressed castings, subject to high impact, designed to low safety factors.

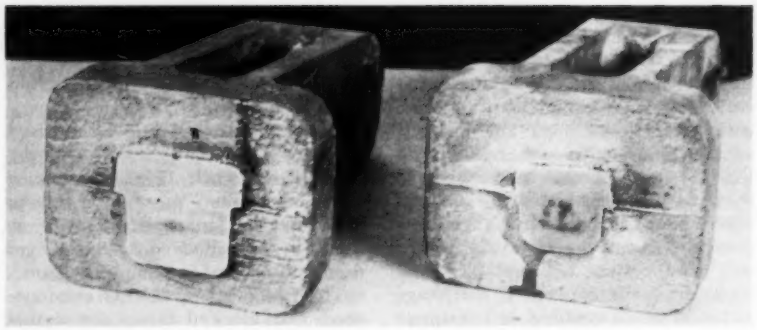


Fig. 4 . . . Riser contacts of castings etched to show areas of carbon segregation.

These two limitations to necked down risers, shrinkage due to long feeding distance and segregation, are the only legitimate limitations to this principle known to the writer. There are at least ten illegitimate limitations, or objections . . . objections that have nothing to do with the necked down principle, but are due to sloppy applications of other basic foundry principles.

The most important point in the application of this principle is a resolve by the whole foundry, from the president on down, to make this principle work. Difficulties and scrap that arise should not be judged by individual cases, but by the over-all situation. Charge off the job that goes sour against the over-all savings. Then, and this is important, find out what made this job go sour. Perhaps such an investigation will disclose that the necked down principle cannot be used for this particular casting. But the chances are 5 to 1 that something else is wrong.

References

1. C. W. Briggs, *Metallurgy of Steel Castings* (1946), p. 284. Published by McGraw-Hill Book Co., New York.

2. John Howe Hall, "Gates and Heads for Steel Castings," *Foundry*, vol. 80, no. 2, February 1952, p. 98.

3. S. W. Brinson and Joseph A. Duma, "Observations on Knock-off Risers as Applied to Steel Castings," *Transactions, A.F.S.*, vol. 56, pp. 586-601 (1948).

4. H. F. Bishop, E. T. Myskowski, and W. S. Pellini, "Contribution of Riser and Castings End Effects to Soundness of Casting Steel Bars," *Transactions, A.F.S.*, vol. 59, pp. 171-180 (1951).

5. H. F. Bishop and K. E. Fritz, "Segregation in Small Steel Castings," *Transactions, A.F.S.*, vol. 55, pp. 412-429 (1947).

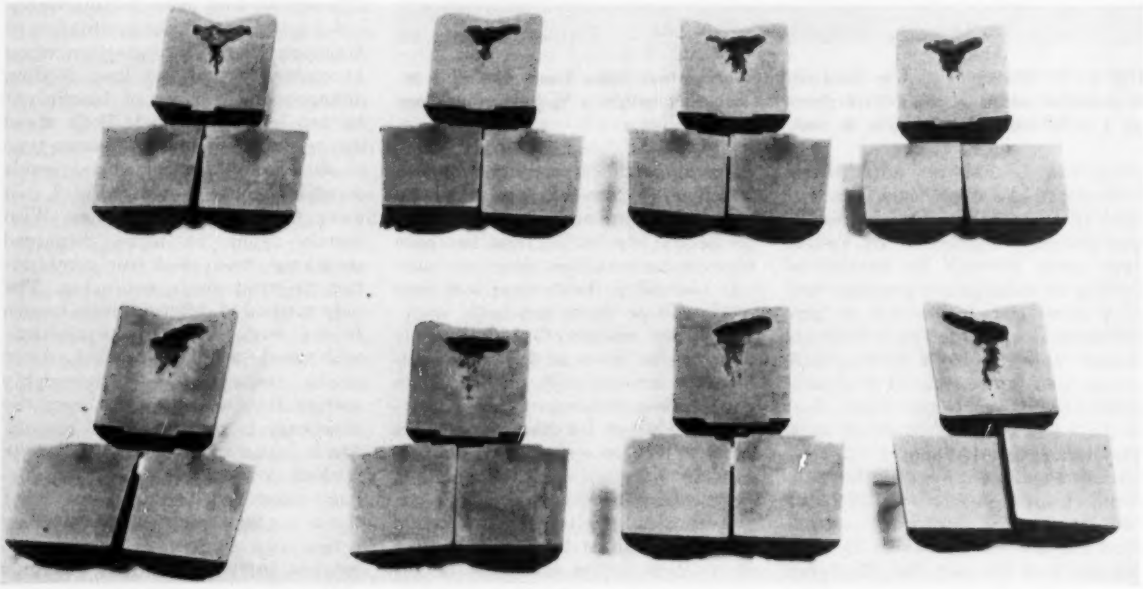


Fig. 5 . . . Castings sectioned and etched to show segregation under riser. Segregation decreases as contact area increases.

Redesigning for malleable iron cuts costs, improves product

How malleable iron castings replaced fabricated parts and the advantages gained are illustrated by these examples accumulated with the help of the Malleable Founders' Society. Use of castings resulted in lower cost, reduced weight, improved appearance, uniformity, and better machinability.

■ The plow swivel in Fig. 1 was originally a weldment of four pieces weighing 2½ lb. Redesigned as a malleable casting, the weight was reduced to 2 lb. In supplying these castings, Eastern Malleable Iron Co., Wilmington, Del., eliminated the personal factor involved in the built-up assembly.

The hydraulic press valve (Fig. 2, upper) was originally machined from forged steel. Redesigned, it was made by Eastern Malleable as a casting with all holes cored, requiring but light final machining. Weight saving was 25 per cent. Advantage of malleable's ease of machining combined with the coring to reduce machining cost by 80 per cent.

Also formerly forged were the valve stop-collars shown in the lower part of Fig. 2 as malleable iron castings. Produced by Wagner Malleable Iron Co., Decatur, Ill., the conversion results were: much machining eliminated . . . easier machining . . . less metal to purchase . . . and lower cost.

Figure 3, lower, shows an elevator control mechanism part that was originally built up from a piece of steel bar stock and three flat steel pieces. For economy in manufacture, dependability, and better appearance, the part was made as a one-piece malleable casting by Eastern Malleable. The interior of the round section was cored to reduce weight. Machining cost of the casting ran lower than the fabricated piece.

Figure 3, upper, is a refrigerator car valve casting, redesigned to include all necessary components in a single casting. Produced by Milwaukee Malleable Co., Milwaukee, the new design takes fullest possible advantage of the casting process to easily make a highly complex shape. Result is simplified production with

Fig. 1 . . . Though plow swivel is only 2½ in. high, weight as casting was ½ lb less.

Fig. 2 . . . Machining cost of valve (upper) was reduced 80 per cent when cast in malleable. Malleable castings (lower) are cheaper than forgings they replaced.

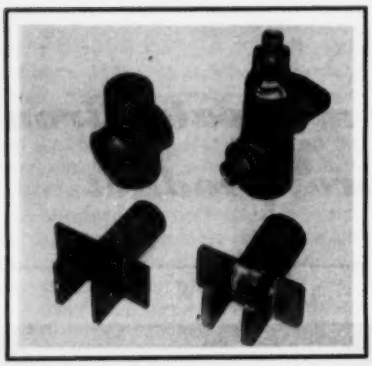


Fig. 3 . . . Redesigned for simplicity.

Fig. 4 . . . Casting looks much better.

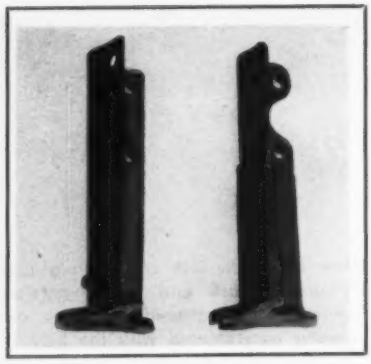


Fig. 5 . . . Casting replaces assembly.

a single piece doing a job formerly done by several.

Conversion from steel stamping to malleable iron is shown in Fig. 4. This radius rod socket casting made by Lake City Malleable Co., Cleveland, reduced the cost, eliminated steel blanking scrap, and gave improved appearance.

Corrosion resistance was a problem along with construction simplification and appearance improvement, with the mail-box leg shown in Fig. 5. A one-piece malleable casting replaced the assembly of stamping, small foot casting, and rivet. The casting solved the problems with no increase in weight.

Another Eastern Malleable casting, the heavy-duty mower tractor hitch (Fig. 6), was redesigned for malleable after originally being produced as a weldment. Advantages: reduced weight and cost, improved appearance, and uniformity.

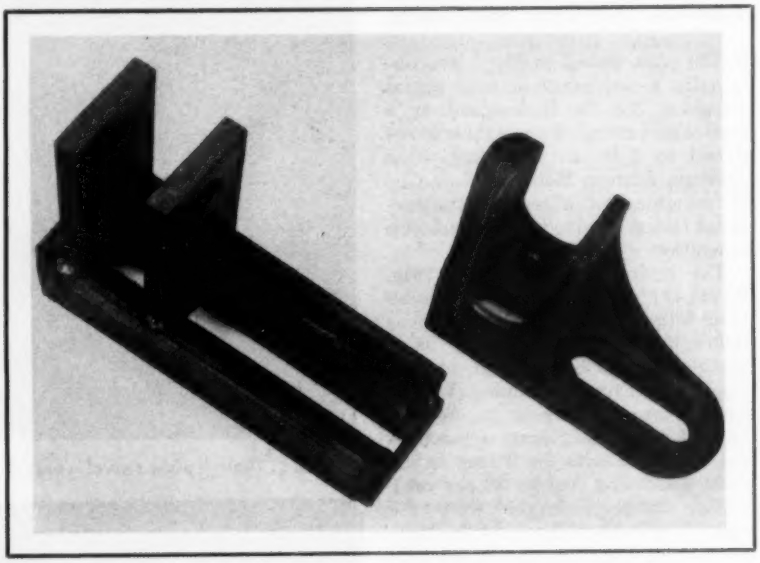


Fig. 6 . . . Malleable casting has lower weight, costs less, gives uniformity.

▶ *Calendar of future meetings and exhibits*

February

16-19. . Industrial Ventilation Conf.
Kellogg Center for Continuing Education, Michigan State College, East Lansing, Mich.

17-19. . Foundry Health Conference
University of Illinois, Urbana. Sponsored by A.F.S. and U. of I.

19-20. . Southeastern Regional Conf.
Tutwiler Hotel, Birmingham, Ala. Sponsored by Birmingham District and Tennessee Chapters, and University of Alabama Student Chapter.

March

2-6. . American Society for Testing Materials
Statler Hotel, Detroit. Spring Meeting.

11-12. . Fdry. Educational Foundation
Hotel Cleveland. TAC-UAC Conference and Annual Meeting.

16-18. . Nat. Assoc. Waste Material Dealers, Inc.
Conrad Hilton, Chicago. 40th Annual Convention.

16-20. . Nat. Assoc. Corrosion Engrs.
Chicago. Symposium: "*Protective Coatings.*"

17-18. . Steel Founders' Society
Edgewater Beach, Chicago. Annual Meeting.

18-20. . American Society of Tool Engineers
Hotel Statler, Detroit. 21st Annual Meeting.

23-27. . American Society for Metals
Pan-Pacific Auditorium, Los Angeles. Western metal congress and exposition.

24-25. . Foundry Health Conference
University of Wisconsin, Madison, Wis. Sponsored by A.F.S. and U. of I.

April

31-April 2. . Magnesium Association
Washington National Guard Armory, Washington, D. C. First International Magnesium Exposition.

9-10. . Malleable Founders' Society
Illinois Institute of Technology. 4th Annual market development conference.

20-22. . 1953 Metal Powder Show
Hotel Cleveland, Cleveland. Ninth Annual Meeting.

25-May 10. . Liege International Fair
Liege, Belgium.

May

4-8. . A.F.S. 57th Annual Convention
Chicago. Five-day, non-exhibit convention.

Room and high temperature properties

Synthetically bonded molding sand

MARY T. ZEMANTOWSKY / *National Bureau of Standards, Washington, D. C.*

In this series of tests no direct relationships were observed between the A sintering point, the bentonite-water ratio, and the other properties of sand mixtures studied. Effect of moisture variations was usually less pronounced than variations in bentonite content.

■ A knowledge of the maximum temperature to which the sand can be subjected is important to the foundryman. Above that temperature the sand may burn onto the castings, making cleaning difficult and increasing production costs.

A method developed by Saeger[1,2] for determining the sintering point involves the measurement of the temperature at which an electrically heated ribbon adheres to the surface of the sand specimen. The apparatus and procedure were later modified and standardized by the American Foundrymen's Society so that more consistent results could be obtained between different laboratories[3,4].

In order to make the test applicable to all types of molding sands, the sintering tests were expanded to include sintering points "A" and "B"[4,5,6]. (Editor's Note: Further reference applicable to references 2, 3, and 6 can be found in the A.F.S. publication, *Foundry Sand Handbook*, p. 99, 1952). The "A" sintering point is the lowest temperature at which the surface of the sand grain has softened enough so that adherence of the platinum ribbon to the sand surface is sufficiently strong to bend the ribbon to a V when the ends are lifted.

This is a sharp end point except for sands of very low dry strengths. With these, the bond between the sand grains may be so weak that they lift off with the ribbon. For these low strength sands, measurement of the "B" sintering point is more useful. The "B" sintering point is the lowest at which indication of fusion can be seen at a magnification of 25-30 diameters.

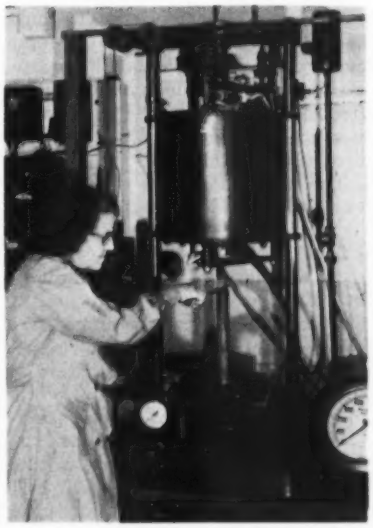


Fig. 1 . . . Placing a sand specimen on the post of the dilatometer, Mary T. Zemantowsky prepares to make sand test.

The usefulness of the sintering test is increased as more information correlating the sintering test with other properties of molding sand becomes available. Dietert and coworkers[7] found that use of sands with high sintering temperatures resulted in a decrease in casting defects. Dietert[8] also found that a contraction resulting from heating sand samples to 2500 F decreased with increase in the sintering temperature. Caine[9], however, was not able to correlate sintering point of the sand and adherence of the sand to castings.

Investigations on the effect of elevated temperatures on the hot strengths of sands were sponsored by the American Foundrymen's Society and conducted under the direction of the Research Committee of the Sand Division of the Society.

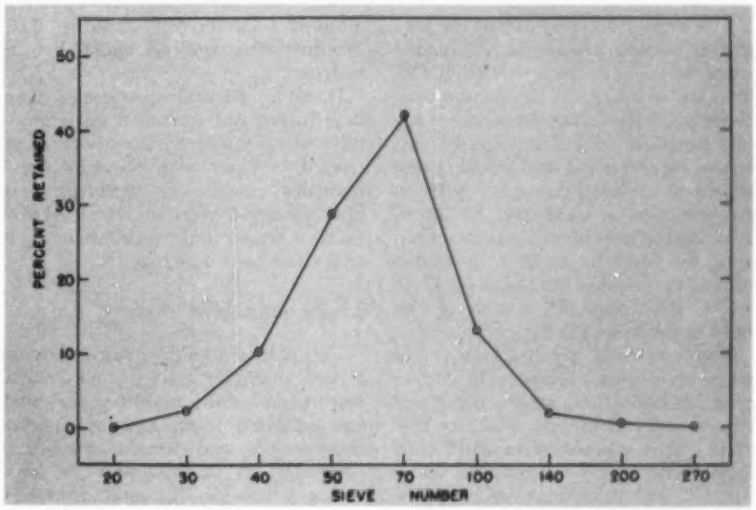


Fig. 2 . . . Grain distribution curve for sand used in tests reported here.

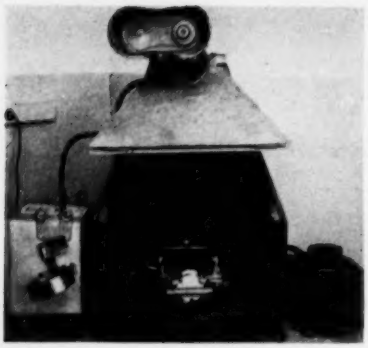


Fig. 3 . . . Sintering test apparatus used to determine A and B points.

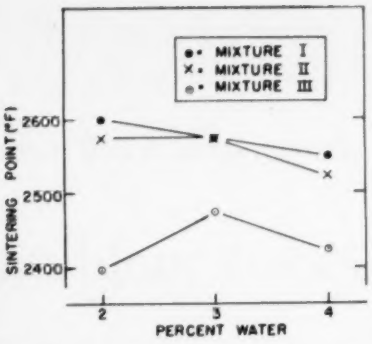


Fig. 4 . . . Effect of moisture on A sintering point of three sand mixtures.

The results were reported by York[10], Young [11,12], Williams[13,14,15,16], Williams and Kyle[17], and Fraser and Kyle[18,19]. Additional data on the effect of elevated temperatures on the compressive strength of mold and core materials have been reported by Hudson[20], Dietert and coworkers [21,22,23], Dunbeck[24,25], Riggan[26], Pragoff and Albus[27,28], Rassenfoss[29], Davies and Rees[30], Kleber and Meyer[31], Satz[32], and Morey and Ackerlind[33].

The purpose of this paper is to present data on sintering temperatures, hot compressive strengths, and green properties of washed silica sand mixtures containing specific additions of western bentonite, at different moisture contents, and to determine if there is a relationship between the "A" sintering point and the hot compressive strength and green properties of these sand mixtures.

Materials and procedure

The base sand used in this investigation was sub-angular, washed silica sand with an average A.F.S. fineness number 49. To insure uniformity of the sand throughout the investigation an ample supply was mixed by shoveling and riddling and stored in a closed container without any addition of moisture. At intervals during the investigation screen analyses were made that showed a range of fineness numbers of 47 to 50. A size-frequency curve of the sand is given in Fig. 2.

The mixtures selected for study were as follows: Mixture I—98 per cent washed silica sand with 2 per cent western bentonite; Mixture II—97 per cent washed silica sand with 3 per cent western bentonite; Mixture III—95 per cent washed silica sand with 5 per cent western bentonite.

Mixtures for all tests were prepared in an 18-inch laboratory muller in 2000-gram batches as recommended in the American Foundrymen's Society *Foundry Sand Testing Handbook*[6] for synthetically-bonded sands. The details of the procedure used are as follows:

The silica sand was dried for at least 1 hour and the western bentonite for 4 hours in an electric oven at 105-110 C. Both were then cooled to room temperature. A weighed quantity of the dried sand and bentonite was mulled for two minutes in a covered muller. After a two-minute interval, to give the dust time to settle, a calculated amount of water to produce the desired moisture content plus an additional amount to allow for evaporation during mixing was gradually added (within 30 seconds). Mulling was continued for 5 additional minutes. The sand mixture was quickly removed from the muller and riddled through a ¼ in. sieve directly into two-quart jars, which were sealed and the contents allowed to stand for 2 hours. The mixture was riddled again before testing.

Room temperature properties were determined on batches of each mixture with moisture contents ranging from 1 to 4 per cent. Elevated temperature properties (sintering and hot strength) were determined for each mixture tempered with 2, 3 and 4 per cent moisture.

Made standard tests

The A.F.S. standard specimens of 2-inch diameter and 2-inch height were used for the room temperature and sintering tests. Moisture, green compressive and tensile strengths, permeability, hardness and "A" sintering points of the sand mixtures were determined in accordance with the procedures described in the American Foundrymen's Society *Sand Testing Handbook*[6]. The apparatus used (Fig. 3) is a modification of the Saeger design[2].

The data reported for hot compressive strength were obtained with a 1940 model commercial dilatometer (Fig. 1), since there is no A.F.S. standard method for determining hot compressive strength. Specimens 1⅛ in. diameter x 2 in. were used. They were double-rammed three times, dried in an oven at 105-110 C for 2 hours, cooled and stored in a desiccator. The test procedure used was as follows:

1. The dilatometer was brought up to the desired temperature.

2. The specimen was placed on a flat refractory disc (1⅛ in. diameter by ⅜ in. thick) and a plano-convex refractory disc (1⅛ in. diameter by 3/16 in. thick) was placed with its plane side on top of the specimen. This assembly was then inserted in the dilatometer.

3. The furnace was lowered within 10-20 seconds and the specimen was soaked at the test temperature for 12 minutes. This time included 4 minutes for recovery of furnace temperature. The load was applied at the end of the 12-minute period. The loading was continued until the specimen fractured.

4. The constant rate of loading used was 1-inch per minute table rise under no-load condition.

5. Tests were made at the following temperatures: 1000, 1300, 1500, 1700, 1800, 1900, 2000, 2200, and 2400 F.

Room temperature tests

The effect of moisture content ranging from 1 to 4 per cent on some room temperature properties of sand Mixtures I, II and III is shown in Fig. 5; the values as plotted are the averages of three tests. Variation in the moisture content had no significant effect on the properties of the sand containing 2 per cent bentonite (Mixture I). The general trend was for the compressive and tensile strengths, hardness and permeability to decrease slightly with an increase in water content of the sand containing 3 per cent bentonite (Mixture II). The same trend is also shown in the properties of the sand containing 5 per cent bentonite (Mixture III) when the water content was 2 per cent or greater. However, the values for the different properties of this mixture were increased appreciably by increasing the water from 1 to 2 per cent.

The effect of bentonite additions on some room temperature properties is shown in Figure 6. The green tensile and compressive strengths and hardness increased with an increase in bentonite content, whereas the green permeability tended to decrease.

The results of determinations of "A" sintering points on Sand Mixtures I, II and III tempered with 2, 3 and 4 per cent moisture are compared in Fig. 4. No marked difference is observed between Mixtures I and II containing 2 and 3 per cent bentonite, respectively, but increasing the bentonite to 5 per cent caused a decided lowering of the sintering point for all mositure contents; this conforms with the general opinion on the effect of bentonite on the sintering temperature. There is no obvious explanation for the higher sintering temperature of Mixture III with 3 per cent moisture as compared with either the 2 or 4 per cent moisture.

Hot compressive strength

The effect of moisture on the hot compressive strength of the three sand mixtures at temperatures of 1000 to 2400 F is shown by the results summarized in Fig. 7, 8 and 9. The values for hot compressive strength are, in each case, an average of 4 tests. The standard deviation of each test value is within 10 per cent of the average. At any given temperature up to about 2000 F, the hot strengths of each of the three sand mixtures increase with increase in moisture. At temperatures of 2200 and 2400 F the effect of moisture on the hot compressive strength is negligible. At each moisture content, the compressive strength is a maximum at 1900 F for all the mixtures. The drop in strengths of Mixtures I and II, but not in Mixture III, with a change in temperature from 1700 to 1800 F is apparently related to the bentonite and not the moisture and will be considered in connection with the effect of bentonite on the hot strength.

These data are reassembled in Fig. 10, 11 and 12 to show the influence of bentonite on the hot strength of washed silica sand with three different moisture contents. At each test temperature within the range of 1000 and 2000 F the hot strength for each of the three moisture contents increased, with increase in benton-

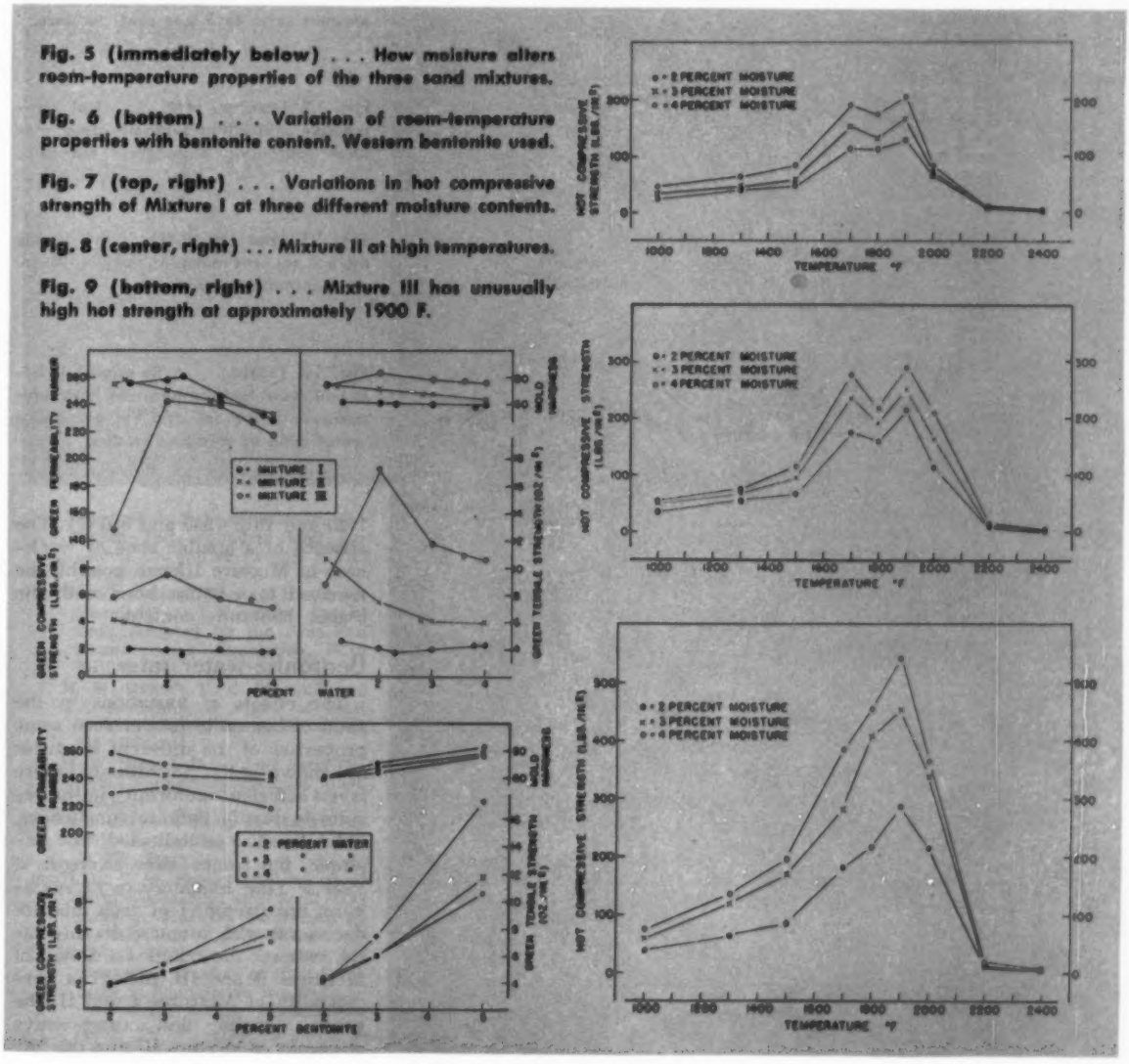
Fig. 5 (immediately below) . . . How moisture alters room-temperature properties of the three sand mixtures.

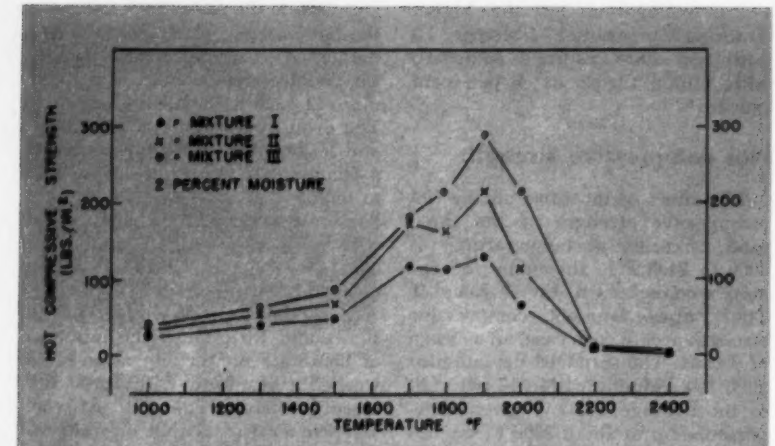
Fig. 6 (bottom) . . . Variation of room-temperature properties with bentonite content. Western bentonite used.

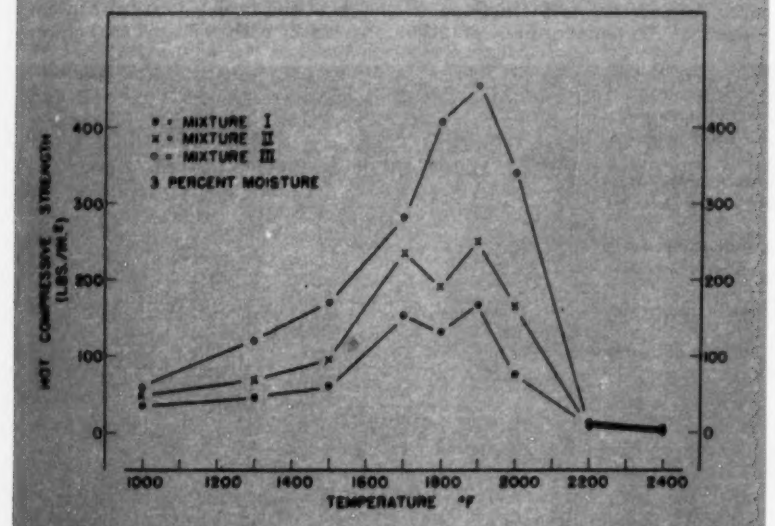
Fig. 7 (top, right) . . . Variations in hot compressive strength of Mixture I at three different moisture contents.

Fig. 8 (center, right) . . . Mixture II at high temperatures.

Fig. 9 (bottom, right) . . . Mixture III has unusually high hot strength at approximately 1900 F.







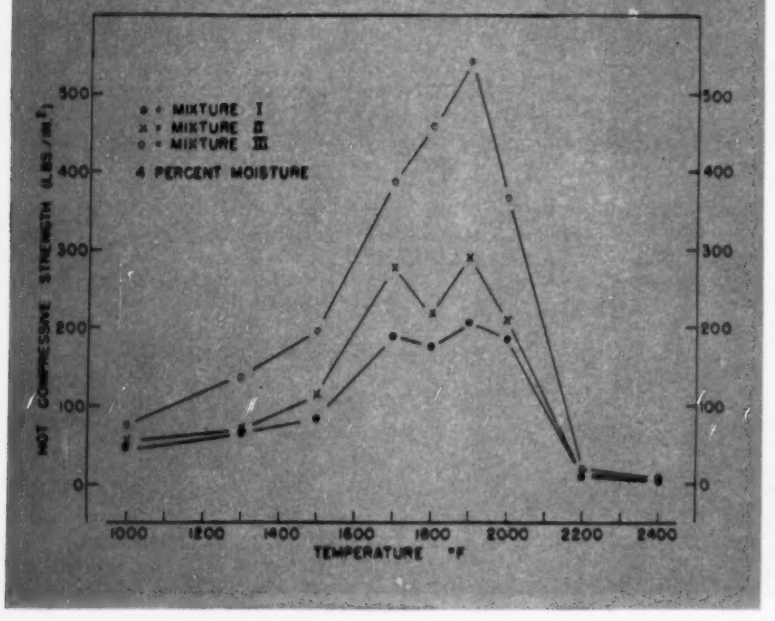


Fig. 10 (top, left) . . . **Effect of bentonite on hot compressive strength of washed sand at 2 per cent moisture.**

Fig. 11 (center, left) . . . **Hot compressive strength in bentonite-sand mixtures containing 3 per cent moisture.**

Fig. 12 (bottom, left) . . . **Mixtures have 4 per cent moisture, varying Western bentonite content.**

Fig. 13 (right) . . . **Relationship between room temperature and high temperature properties and the bentonite-water ratio of mixtures studied.**

ite, reaching a maximum at 1900 F. At 2200 and 2400 F, the hot strength was not affected by the bentonite. Mixtures I and II showed a drop in strength with increase in temperature from 1700 to 1800 F; this was not observed with Mixture III. A similar drop in the hot strength of sand mixtures has been observed in the vicinity of 1800 F by other investigators.[17,18,33]

The drop in hot compressive strength of Mixtures I and II at 1800 F indicates a region of weakness which may be the result of a reaction in the bentonite similar to that reported by other investigators[34,35] in certain clays between 1725 and 1815 (940 and 990 C). The absence of a similar zone of weakness in Mixture III can possibly be ascribed to a better bond with the higher bentonite content.

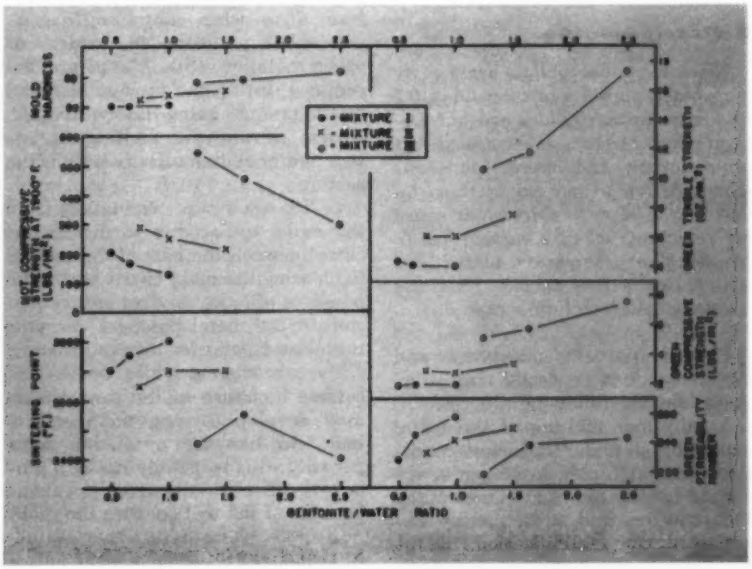
Bentonite-water ratio

The effects of variations in the ratio of bentonite to water on some properties of the different mixtures are shown in Fig. 13. Although there is not sufficient uniformity in the results to justify definite conclusions, some trends are indicated. For example, the compressive strength at 1900 F (the temperature of maximum hot strength) of each mixture decreased with increase in this ratio, where the mold hardness of Mixtures II and III, the green permeability of Mixtures I and II, the green tensile and compressive strengths of Mixture III and the "A"

sintering point of Mixture I all increased with an increase in the ratio of bentonite to water.

Bibliography

1. Sintering Test of Molding Sand. NBS Letter Circular 248, Apr. 24, 1928.
2. Testing and Grading of Foundry Sands, American Foundrymen's Association, Chicago, Ill. (1931) p 108.
3. Testing and Grading of Foundry Sands, American Foundrymen's Association, Fourth Edition (1938) pp. 58, 59 and 146-149.
4. Progress Report of the Sintering Test Subcommittee Foundry Sand Research Committee, Trans. A.F.S. *49*, 552 (1941).
5. Report of the Subcommittee on Sintering Test, Foundry Sand Research Committee, Trans. A.F.S. *50*, 785 (1942).
6. Foundry Sand Testing Handbook Standards and Tentative Standards, Adopted by the American Foundrymen's Association, Fifth Edition 1944.
7. H. W. Dietert, E. E. Woodliff and J. A. Schuh, A Study of Steel Molding Sand, Trans. A.F.S. *46*, 257 (1938).
8. H. W. Dietert, Does Your Sand Behave? Foundry *66*, No. 9, 26 (Sept. 1938).
9. J. B. Caine, A Study of "Burnt On" or Adhering Sand, Trans. A.F.S. *53*, 377 (1945).
10. H. L. York, Report of Progress of Sand Research on Steel Sand Mixtures at Elevated Temperatures, Trans. A.F.S. *47*, 809 (1939).
11. J. R. Young, Progress Report on Investigation of effect of High Temtures on Steel Sands. No. 2—Comparison of Specimen Sizes, Trans. A.F.S. *49*, 646 (1941).
12. J. R. Young, Progress Report on Investigation of Effect of High Temperatures on Steel Sands, Trans. A.F.S. *50*, 977 (1942).
13. D. C. Williams, Fourth Progress Report on Investigation of Physical Properties of Steel Foundry Sands at Elevated Temperatures, Trans. A.F.S. *52*, 979 (1944).
14. D. C. Williams, High Temperature Sand Testing, Trans. A.F.S. *53*, 175 (1945).
15. D. C. Williams, Split Type Specimen Tube for Elevated Temperature Sand Testing, A.F.S. *53*, 248 (1945).
16. D. C. Williams, High Temperature Sand Testing, Trans. A.F.S. *54*, 489 (1946).
17. D. C. Williams and P. E. Kyle, Sand Testing at Elevated Temperatures, Trans. A.F.S. *55*, 607 (1947).
18. J. P. Fraser and P. E. Kyle, Properties of Steel Sands at Elevated Temperatures, Trans. A.F.S. *56*, 345 (1948).
19. J. P. Fraser and P. E. Kyle, Properties of Steel Sands at Elevated Temperatures, Trans. A.F.S. *57*, 89 (1949).
20. Frank Hudson, Some Properties of Mould and Core Materials at Elevated Temperatures, Foundry Trade *53*, 411 (Dec. 5, 1935).
21. H. W. Dietert and E. E. Woodliff, Hot Strength and Collapsibility of Foundry Sands, Trans. A.F.S. *47*, 349 (1939).
22. H. W. Dietert, R. L. Doelman, and R. W. Bennett, Mold Surface Properties at Elevated Temperatures, Trans. A.F.S. *52*, 421 (1944).
23. H. W. Dietert, Effect of Table Rise (Strain Rate) on Hot Strength of Bentonite Bonded Sands, Trans. A.F.S. *53*, 413 (1945).
24. N. J. Dunbeck, American Synthetic Sand Practice, Trans. A.F.S. *49*, 141 (1941).
25. N. J. Dunbeck, Test Hot Strength of Molding Sand, Foundry *69*, 39 (Feb. 1941).
26. Fred B. Riggan, The Use of the Hot Strength Test as a Tool for Controlling Core Mixtures, Trans. A.F.S. *50*, 1185 (1942).
27. Emile Pragoff, Jr., and C. P. Albus, The Effect of Resin Binder Additions on the Properties of Molding Sand, Trans. A.F.S. *50*, 337 (1942).
28. Emile Pragoff, Jr., and C. P. Albus, Effect of Elevated Temperatures on Foundry Cores, Trans. A.F.S. *51*, 935, (1943).
29. John A. Rassenfoss, Reproductibility of Elevated Temperature Sand Test Results, Trans. A.F.S. *52*, 711 (1944).
30. W. Davies and W. J. Rees, The Hot Strength Characteristics of Molding Sands, Iron and Steel Inst. *52*, 61 (1945).
31. L. A. Kleber and H. W. Meyer, Molding Sand Properties at Elevating Temperatures, Trans. A.F.S. *53*, 200 (1945).
32. Arnold Satz, Elevated Temperature Tests in Sand Control, Trans. A.F.S. *53*, 319 (1945).
33. R. E. Morey and C. G. Ackerlind, A Study of the Effect of Various Binders and Additives on the Hot Strength of Molding Sand, Trans. A.F.S. *58*, 411 (1950).
34. Raymond A. Heindl and Lewis E. Mong, Length Changes and Endothermic and Exothermic Effects During Heating of Flint and Aluminum Clays, J. of Research, National Bureau of Standards, Vol 23, 3 RP 1243, 427 (Sept. 1939).
35. H. Insley and R. H. Ewell, Thermal Behavior of Kaolin Minerals, J. of Research, National Bureau of Standards, Vol 14, 5 RP 792, 612 (May 1935).



▶ *New safety films released by National Safety Council*

Position of the foreman in plant safety programs is the theme of two safety films just released by the National Safety Council.

"Pick Your Safety Target," an all-color cartoon film based on actual accident-reduction plans with industry, features a foreman beset with an accident-ridden department. The film shows how a definite accident pattern emerges. From the pattern, a series of safety targets are set up, which provide the foreman with specific goals to be achieved.

The second film, *"A Gray Day for O'Grady,"* employs a series of comedy situations to dramatize the high cost of accidents. O'Grady, the new foreman, learns that it takes time and money to prevent accidents, but that it takes a lot more time and money to have accidents and that the difference is worth it.

"A Gray Day for O'Grady" is available in 35mm sound slidefilm (b & w) and 16mm sound motion picture (b & w). *"Pick Your Safety Target,"* filmed in stop-motion cartoons (color and b & w) is available in 35mm sound slide and 16mm sound motion picture. For additional information and prices, write the National Safety Council, 425 North Michigan Ave., Chicago 11, Ill.

Shop talk

Practical questions and answers

▶ Analyzing castings

If we were to send you a casting or some borings from a casting, could you give us the analysis? We are anxious to duplicate our iron mixture to produce the same kind of castings.

A.F.S. is unable to offer this kind of service, as we have never had a chemical analytical laboratory. However, there are a number of commercial laboratories that do a very excellent job of running analyses of this type. We recommend that you send them a piece of the casting and let them take their own drillings, since the accuracy of the end result is to some extent dependent upon the technique of taking the borings, particularly as they relate to the total carbon content of the metal.

▶ Shell molding

One of our largest customers for gray iron has asked us to make some of his castings by the shell mold process so he won't have to do so much machining. How do we get started?

Little detailed operating information has been published and if you do not wish to set up for production you may want to deal with shops already in operation. Some unknown number of foundries is experimenting with the process and at least 10 foundries are known to be producing shell mold castings for customers. In some instances, shells are made in one plant and poured in a foundry some distance away which can provide the alloy required. Orders handled range from 100 to 100,000 castings. Two shops are producing shell cores, one for its own production, the other for shipment to a distant user (AMERICAN FOUNDRYMAN, December 1952, page 42).

In addition to the article above, we recommend "Current Status of the Shell Mold or C Process of Precision Casting Metals" as a good general discussion which includes many references. Order bulletin PB 106640 from the Office of Technical Services, Department of Commerce, Washington 25, D. C.; enclose 25¢.

▶ Pinhole porosity

When we polish yellow brass castings, black pinholes or inclusions, 0.1 to 1 mm, appear. They are not noticed when a casting is machined, but grow larger and more numerous when we try to get rid of them by grinding. They are a frequent cause for rejections when a casting has to be nickel or chromium plated. We notice this defect whether we use ingots, virgin metal, or scrap.

Pinhole porosity in brass and bronze castings generally may originate from the following sources:

1. Improper melting of the metal —melting it under reducing conditions, in which case hydrogen is absorbed by the metal at the elevated temperatures and subsequently expelled during solidification in the mold due to the diminishing solubility of the gas as the temperature drops.

2. Mold gases or air which can be entrained in the molten metal stream due to faulty pouring methods or poorly designed sprues, runners, or ingates.

3. Oxide inclusions entrained in the metal, originating from faulty melting methods, or more usually, from dirty scrap containing a considerable quantity of oxides or other metallic solids. These are not reduced during the process of metal melting, and, being finely divided, persist during the melting operation and of course solidify within the casting.

4. Non-metallics originating from the mold, either due to insufficient cleanliness on the part of the molder in clearing the mold cavity and metal passages of loose sand, or actual erosion in the metal passages carrying these sand particles into the casting.

Once in a great while, due to excessive moisture in the sand, steam may develop causing the metal to boil and likewise producing some porosity; this is usually not of a pinhole type but is usually localized because of the wet spots in the mold.

▶ Hard spots

Occasionally a small iron casting will come through with a hard spot on one or more of the small bosses while the rest of the casting will be

▶ Rammed up and poured

Playing It Smart

In ten years as a foundryman
I've often skinned my nose,
Smashed my fingers, burned my arms,
But I never hurt my toes.

The reason's very simple;
It's only that I choose
To play it smart, I always wear
A pair of safety shoes.

The other night when I retired
The baby was a-bawlin.
I couldn't get a wink of sleep
So loudly was he squallin.

Arising from my downy couch
To tend the little midget,
I stumbled on a table leg
And broke the largest digit
Of my left pedal extremity—

Three full weeks on crutches;
It made me pretty mad!
The only lost-time accident
Yours truly ever had!

But you'll admit I play it smart
I'm wise—I use my head.
For now I wear my safety shoes
Even when I go to bed!

BILL WALKINS

Copyright by Electric Steel Foundry Co.

dead soft. The microscope shows the spot to be pure cementite. Both physical and chemical analyses show that the casting should be perfectly soft throughout. Furthermore, these castings are very difficult to anneal, requiring a temperature of approximately 1550 F for five hours, with slow cooling. In a similar situation in the past, spectroscopic analysis showed traces of tellurium and vanadium at these hard spots, which do not show up in ordinary chemical analysis. The same castings made of pig iron from other source do not have these hard spots. Our theory is that the trouble is due to a considerable amount of foreign ores in the offending pig iron.

You are probably on the right track. If tellurium is present, even in very small percentages such as 0.003 to 0.004, you may expect to see its effect in the finished castings because of its extremely potent carbide stabilization influence. Such elements as selenium, arsenic, vanadium, and chromium also act similarly in varying degrees. Also, hard spots may develop from ferroalloy additions, particularly when they are carbide stabilizers, due to incomplete solution or uniform dispersion of these alloys.

If the bosses are very small it is possible that excess moisture in the sand may produce sufficient added chilling effect to stabilize the carbides. Also, it is possible that lower total carbon content in the face of a given silicon content in the iron—yielding a metal of lower carbon equivalent—will produce an iron having greater chilling tendency. In such a case, the adoption of ladle additions in the form of ferrosilicon, silicon carbide, and other combinations available produce a strong innoculating effect, thereby overcoming chilled spots.

▶ Wants core sand reclaimed

We are interested in reclaiming our core sand. We use 10 tons of oil bonded cores daily in our foundry, making our mixture from a sharp sea sand which has to be transported 150 miles at considerable cost.

Whether reclamation of core sand is practical depends upon local economic conditions—the cost of new sand as compared with the expense of reclaiming the old. A number of foundries find reclamation of core sand profitable. Thermal, pneumatic, and wet methods of sand reclamation are used with varying success depending on local conditions, including whether or not the core sand is to be reclaimed separately or is to become part of the molding sand.

▶ Needs inspection routine

Has anyone developed a simplified routine method of inspecting medium size castings (iron, steel, and nonferrous) at receiving points on purchaser's premises at the time the castings are received from vendor foundries? Purpose of the inspection we desire is to detect as many commonly occurring defects as possible without going to expensive methods like radiographing, etc., so that any rejections that are obvious need not wait on a costly machining operation.

Castings with obvious defects which are not acceptable to you should never leave the foundry. Your first step should be to acquaint your vendors with your requirements so they can do the best possible job for you. You'll find the foundries glad to cooperate.

No standard routine for inspection of castings has been developed. Though desirable, it would be difficult to prepare so that it would be suitable for general application. Reason lies in the size and complexity of castings, the degree of perfection required to meet varying needs, and the actual specifications under which castings were purchased.

In general, in addition to visual examination for superficial defects, a primary consideration is dimensions. If sufficient repetitive operations are involved, there is no substitute for jigs to insure adequate material for machining. These may be supplemented with metal and plastic templates. If only a few castings are involved, use a surface plate or other machined surface on which the castings can be placed and checked at desired reference points by means of a surface gauge, dial indicator, and vernier height gauge.

now, there's an idea!

■ Dust from a standard swing frame grinder is not as easy to control as in the case of most other grinders, but Deere & Co. has one answer to the problem—swing the casting and keep the grinder stationary. The casting is held in the swing frame and brought up underneath the spinning wheel while metal and abrasive dust are effectively exhausted with a minimum air flow. Parts are clamped in the swing frame by hinging the frame just below the wheel. S. C. Rothmann, director of the Deere Industrial Hygiene Engineering Service, whose story on how industrial hygiene engineers guard the health and safety of foundry workers appeared in the August 1952 issue (page 56-60) of AMERICAN FOUNDRYMAN, reported the use of the grinder in one of the company plants.

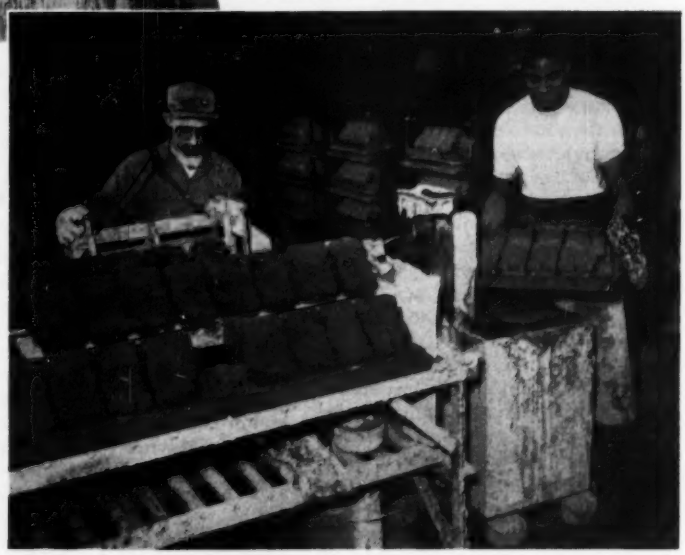
Inverting the swing frame grinders so that the work and not the wheel swings is the way Deere & Co., Moline, Ill., solved the problem of controlling dust.

DELTA CORE WASHES ARE USED *Exclusively* BY

STUDEBAKER

AT THEIR FAMOUS SOUTH BEND FOUNDRY

Dry dipping of port cores with DELTA GRAKOAT



**Dry dipping of V-8 crankcase core with DELTA Z-Z-KOAT*

OTHER DELTA FOUNDRY PRODUCTS

CORE AND MOLD WASHES:
FOR ALL TYPES OF SAND CAST METALS: STEEL, GRAY IRON, MALLEABLE AND NON-FERROUS.

•

PARTING COMPOUNDS

•

MUDDING & PATCHING COMPOUNDS

•

NO-VEIN COMPOUND

•

MOLD SURFACE BINDERS-LIQUID

•

PERMI-BOND

•

DRI-BOND
(Dry Binder)

•

BONDITE BINDER

•

96-B SAND RELEASE AGENT

•

CORE ROD DIP OIL NO. 224X

•

SAND CONDITIONING OIL

•

CORE OILS

•

. . . FOR QUALITY, SPEED AND ECONOMY

DELTA GraKoat Wash . . . (the original white plastic-type wash developed by DELTA laboratories 18 years ago) has been used consistently by leading automotive and tractor foundries ever since it was first introduced.

Here are the reasons why:

1. EASY TO APPLY
2. MOISTURE PROOF
3. NO PRECIPITATION
4. NO GAS
5. HIGHLY REFRACTORY
6. UNUSUALLY HIGH FUSION
7. ADHERES TO SAND
8. PRODUCES SMOOTHER SURFACES
9. COST LESS TO USE

*DELTA Z-Z-Koat Wash is a zirconium wash. It has all the characteristics of DELTA GraKoat Wash plus a higher fusion point and heat conductivity which produce a quick surface-metal set.

A liberal working sample will gladly be sent to you, free of charge, at your request.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SPECIALIZED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

Convention preprint ★

Advantages of insulating an electric furnace roof

CHARLES C. SPENCER / *Melting Supt., Electric Steel Castings Co.*

By using standard materials which are readily available, the author has effected substantial savings in the initial cost of furnace roofs, in uninterrupted service derived from it, and rarely has to shut down the furnace for roof repairs.

For many years the roof on the Electric Steel Casting Co. furnace was constructed of special shaped 13-in. silica bricks. The performance of these bricks was fairly satisfactory but they would occasionally spall, especially when operation was intermittent. The spalled pieces of brick would have to be raked off the slag before tapping, otherwise they would plug up the tapping hole.

Various ways to correct this condition were tried, such as cooling the roof off after the last heat was tapped, raising the doors as soon as possible, and not charging up immediately after the bottom and side walls were repaired but charging the scrap into a cold furnace the next morning. This did not correct the spalling nor did it prolong the life of the roof.

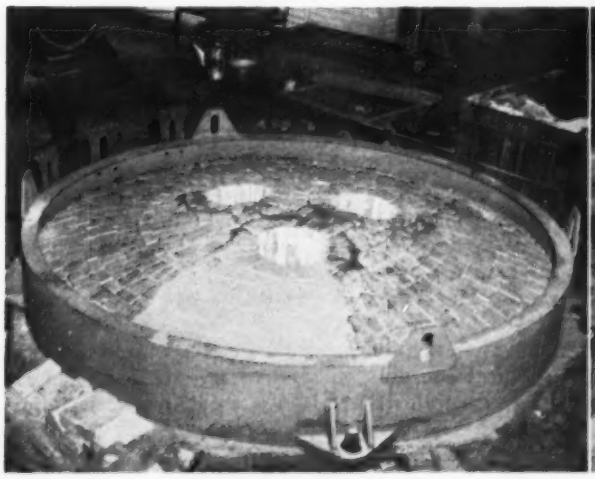
Preprint No. 53-20. This paper will be presented at a Steel Session of the 57th Annual Meeting, American Foundrymen's Society, at Chicago, May 4-8, 1953.

The next method was to repair the bottom and side walls as soon as possible, charge up the furnace, and seal the doors and spout with sand. This seemed more satisfactory and it did decrease spalling, but roof life was still somewhat erratic. Minimum was approximately 120 heats, the maximum approximately 225 heats, averaging throughout the years approximately 170 heats. This difference, it was believed was not caused by any great change in the production schedule, but rather due to spalling.

Tried Insulation

In 1940, experiments were started with a roof constructed of 9-in. standard silica brick. After the bricks were laid up, they were covered with a proprietary insulating material that was being used successfully and extensively in open hearth furnace shops. This is made with expanded vermiculite in a special mesh assortment ranging from ¼-in. to fines. It is a light fluffy aggregate, which readily mixes with water to form a smooth troweling, insulating plaster of great spreading power.

It was troweled smooth to a thickness of 1-in., which is equal to approximately 7-in. of fire brick. The roof



Furnace roof made up of 9-in. standard silica brick.

Insulation 1 in. thick more than doubles roof life.

ran 490 heats, and the experimental roof construction was adopted as standard practice. The method is:

Build the circles that make the electrode openings first, wrapping a wire around the bottom and the top of the bricks to hold them in place. The wires are not removed from the brick but are allowed to become a part of the roof. The rest of the roof is laid up, starting from the water-cooled roof ring. The first row is 9-in. standard super duty clay brick. The remaining rows are 9-in. standard silica brick, consisting of straights, wedges, and No. 1, 2, and 3 arch.

To cut bricks to form a tight and perfect circle is both tedious and costly, so where a whole brick will not fit, the opening is rammed with a mixture of ganister, fire clay and sulphite liquor water. When the opening is too small to ram, ground silica fire clay mixed with water is poured in the small openings.

After the roof is laid with brick and all the holes filled in with ganister or ground silica fire clay, the insulating material is put on top of the brick and troweled smooth.

Roof life has been doubled in the last 12 years, using the above construction. One contributing factor to this longevity, in the author's opinion, is that the roof is insulated. From a maximum of 225 heats on the old type of roof using 13-in. brick, which in initial cost is more expensive than the 9-in. brick, the furnace went to a maximum of 525 heats on the new insulated roof. The experiment of using insulating material on the 13-in. brick was not carried out because the 9-in. brick serves very well. Average over the 12 years has been approximately 400 heats per roof.

Insulation of the furnace roof performs a number of functions, which the writer believes justify the cost of the material and the labor to apply it.

1. The 1 in. of insulation is equivalent to 7 in. of fire brick. This gives a tremendous weight saving since 1¼ lb of the vermiculite mix will cover 1 sq ft of roof surface, 1 in. thick. A 9-ft diameter roof requires only about 80 lb.

2. It gives more uniform power consumption.

3. It keeps iron oxide away from the bricks, and doesn't allow it to work down in the cracks where it would tend to erode the bricks faster.

4. It serves as an electrical insulator between cooling rings, for it is a non-conductor of current.

5. It gives a smooth seal and provides a good surface from which iron oxide and other dust can easily be removed by sweeping or blowing with an air hose.

6. It helps to hold cooling rings in place if flanges are embedded ¼ in. in the material.

7. It reduces spalling by protecting the refractory from the effect of sudden high temperatures in the initial service. This serves to allow expansion to occur at a slower rate, avoiding the stresses set up between hot and cold faces which otherwise results in spalling.

▶ *Report productivity progress at first European seminar*

Decision to establish permanent international contact for exchange of production ideas was made at the first European seminar on foundry productivity. Organized by the French Productivity Centre and the Syndicat General des Fondeurs de France under the auspices of the Organization for European Economic Cooperation, the seminar was held November 5 through 8 in Paris. The meetings were attended by representatives of trade associations, heads of firms which have conducted productivity experiments, and experts who studied productivity in the United States. Some 86 delegates from Austria, Belgium, Denmark, France, Germany, Ireland, Italy, Luxemburg, Netherlands, Sweden, Switzerland, United Kingdom, and United States were present.

Chairmanship of the seminar was taken in succession by Pierre Ricard, president d'honneur, Syndicat General des Fondeurs de France, Pierre Grimanelli, secretary-general of the French Productivity Committee, Maurice Olivier, president of the Syndicat, Noel P. Newman, president of the Council of Iron Foundry Associations (United Kingdom), and Baron A. Krayenhoff, president of the General Association of Netherlands Foundries.

Speakers described productivity experiments carried out in the various countries, drawing attention to the different economic and psychological techniques used.

First obstacle to increased productivity was admitted to be the conservative attitude of both employers and employees toward any change in working methods. The delegates emphasized that initiative must be shown, not only by individual firms, but also by the trade as a whole—workers, executive staffs, and employers must cooperate in a spirit of mutual confidence.

Among developments described as leading to increased productivity were: new molding methods, particularly snap-flask molding; reduction of handling; manufacture of aluminum alloy matchplates; and new methods of cleaning and finishing.

Typical production achievements reported were: Man hours required to produce one ton of high grade iron castings for motor vehicle parts in United Kingdom foundries fell from 131.4 in 1947 to 108.6 in 1950. . . After the Belgian mission returned from America, productivity in one medium-sized firm was increased by 20 per cent in 14 months. . . A French firm which adopted a suggestion system received an average of 20 suggestions a month for work simplification; 900,000 francs ($2,610) were paid out in the form of bonuses. . . In another firm, reorganization of production led to increases of 26 per cent, then 39 per cent, in output. . . . Material handling was markedly improved in a U.K. firm by eliminating needless handling and by mechanization. Before: weight ratio of material handled to castings produced, 113 to 1; distance traveled per ton of castings, 8.6 miles; total vertical lift per ton of castings, 160 feet. After: ratio, 49 to 1; distance traveled, 3.16 miles; vertical lift, 63 feet.

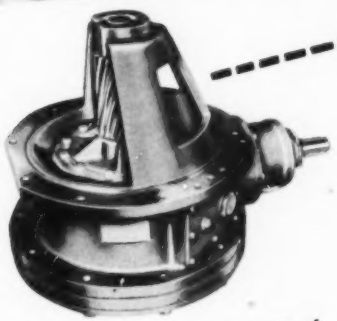
Finally, the delegates stressed the importance of technical consultation services and their part in increasing productivity. It was evident that technical centers such as the Centre Technique des Industries de la Fonderie Francaise, which the delegates visited, could help foundrymen to increase efficiency and reduce waste.

Greater hourly capacity than any other muller!

THE NEW
"80A"
SPEEDMULLOR

The New "80A" Speedmullor Mulls MORE Sand Per Hour To Its Maximum Physical Properties Than Any Other Muller . . . Increasing the Margin of Superiority Already Enjoyed By The "80" Speedmullor!

Redesigned crosshead . . . the ultimate in simplicity . . . provides cleaner operation and improved cooling! Streamlined plows mounted at optimum lift angles for maximum mulling efficiency. Plows and wear plates coated with extra hard abrasion resistant material. All plow parts subject to wear are bolted for easy replacement.



Removable transmission unit for ease of maintenance. Directed force-feed lubrication for longer drive unit life. Involute pump integral part of transmission.

Write for complete information!

BEARDSLEY & PIPER
Div. Pettibone Mulliken Corp.,
2424 No. Cicero Avenue
Chicago 39, Illinois

LOOK TO
BEARDSLEY & PIPER
FOR BETTER METHODS

Here's why more foundries use

MULBAROS

than any other portable muller!

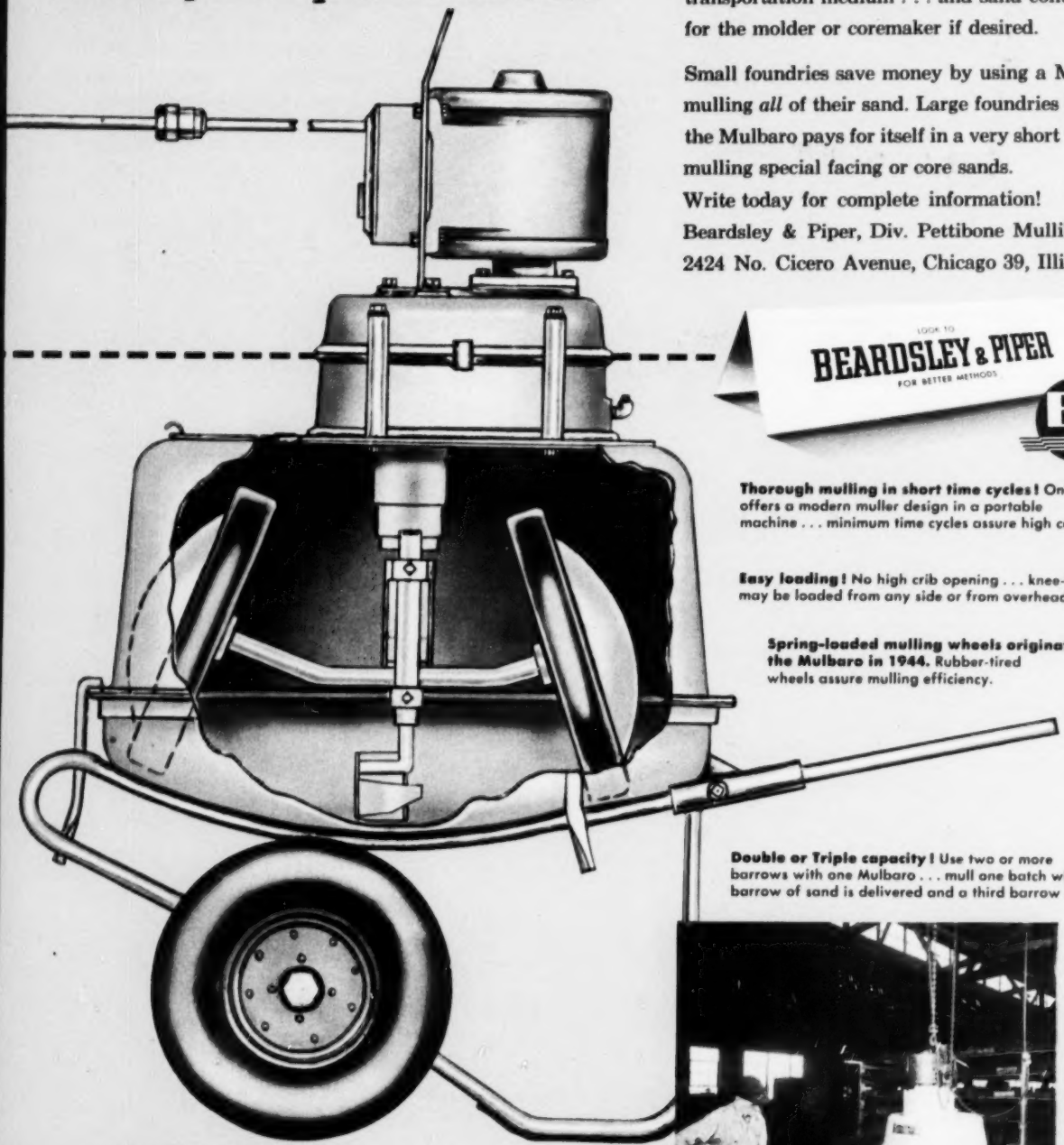
Once loaded, the Mulbaro's barrow is placed beneath the mulling mechanism which is then lowered into position. Mulling is completed in *four minutes* or less, and the sand is ready for delivery anywhere in the foundry. There's no time wasted in loading or unloading. The barrow serves not only as a mulling pan during the mulling cycle, but as the transportation medium . . . and sand container for the molder or coremaker if desired.

Small foundries save money by using a Mulbaro for mulling *all* of their sand. Large foundries find that the Mulbaro pays for itself in a very short time in mulling special facing or core sands.

Write today for complete information!

Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 No. Cicero Avenue, Chicago 39, Illinois.

LOOK TO BEARDSLEY & PIPER FOR BETTER METHODS



Thorough mulling in short time cycles! Only the Mulbaro offers a modern muller design in a portable machine . . . minimum time cycles assure high capacity.

Easy loading! No high crib opening . . . knee-high barrows may be loaded from any side or from overhead hopper.

Spring-loaded mulling wheels originated with the Mulbaro in 1944. Rubber-tired wheels assure mulling efficiency.

Double or Triple capacity! Use two or more barrows with one Mulbaro . . . mull one batch while a second barrow of sand is delivered and a third barrow is loaded.

Less sand handling! Handle the sand once when it's loaded for mulling . . . then deliver it to molder or coremaker in the same barrow.

Really portable! Move the sand . . . not the whole machine.

Foundrymen can't know too much

About practical heat transfer

WILLIAM S. PELLINI / *Chairman, A.F.S. Heat Transfer Committee*

It is desirable along the line of a prolonged research or development investigation to look back and assess the situation which existed at the start, to review the goal intended, the direction taken, and the accomplishment. Only thus may new sights be taken and proper decisions made as to the future course. After eight years of heat transfer research* under the auspices of the American Foundrymen's Society, it is proper that such a review be presented and that future plans be discussed.

Heat transfer is the very basis of the foundry industry—in great part, the foundryman's every day work relates to transferring heat in and out of the metal in such a way as to end up with a salable casting and a profit. The efficiency with which he can accomplish this is dependent on his knowledge of established practices and on the correctness of his intuitive deductions in cases such that the established know-how falls short of his requirements. The foundryman can never know enough regarding his most important working tool—practical heat transfer. The work on the Heat Transfer Committee should be recognized as having as its principal aim the development of new and more exact knowledge regarding the process of heat transfer as related to the solidification of castings, so that the foundryman will be provided with better working or "thinking" tools. It should be recognized also that the Committee's interests are basic to the entire foundry industry and not specific to any specialized field of the industry. It is evident that with such aims the process is never fully completed . . . new goals will arise with time. However, practical accomplishments should accrue along the road requiring summarization and interpretation as is planned for this report.

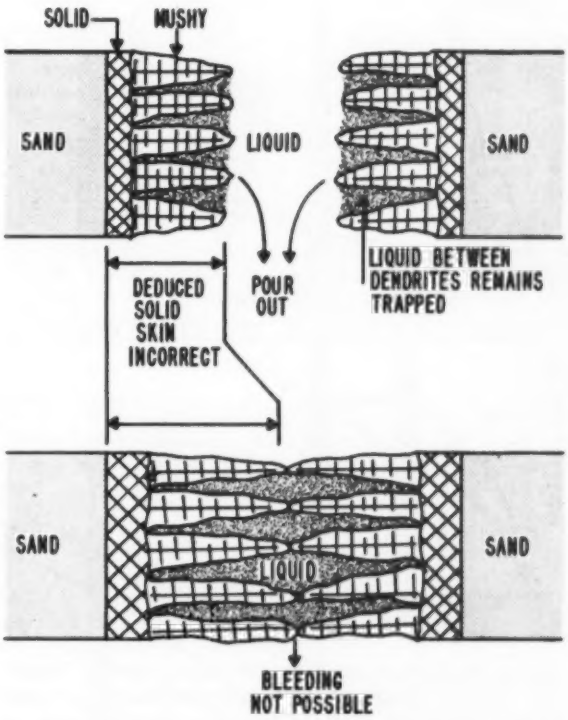


Fig. 1—Why skin thickness observed in "pour out" tests doesn't represent true solidification conditions.

All technologies are basically dependent on a specialized science related to their particular problems. Heat treating, for example, is greatly dependent on the science of transformations which occur in the solid material which is being cooled. Certainly, heat treating was carried out before the day of the development of the now classical S curve information. However, important improvements resulted from the application of this know-how by practical heat treaters. Technologies which operate with deficient scientific tools operate at a disadvantage; in this respect the foundry field has operated at a disadvantage inasmuch as a basic

*The A.F.S. Heat Transfer Committee research covered by this report was conducted under the chairmanship of H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland. Original members of the Committee (1945) included H. A. Schwartz, E. C. Troy, Palmyra, N. J., J. B. Caine, Wyoming, Ohio, and H. F. Taylor, Massachusetts Institute of Technology. The subject report has been reviewed and concurred with by the present membership of the Committee: H. A. Schwartz, E. C. Troy, J. B. Caine, V. Paschkis, Columbia University, C. E. Sims, Battelle Memorial Institute, and E. T. McGuire, Deere & Co., Moline, Ill.

Preprint No. 53-12. This paper will be presented at a Heat Transfer Session of the 57th Annual Meeting, American Foundrymen's Society, at Chicago, May 4-8, 1953.

science related to the solidification of metals was essentially non-existent at the time of the starting of heat transfer work by the A.F.S.

It is no overstatement that during the past eight years a solidification science has been evolved, in part, and that the period and process of its development compares in all respects with the period in the thirties which saw the evolution of a science related to heat treating. The foundrymen should, as the heat treaters did, begin as soon as possible to use the new information available to them.

The approach taken by the Heat Transfer Committee in the initial planning was considered rather radical, and indeed it was. Heat transfer and solidification problems were to be studied, not on the foundry floor but on an electrical panel board having the appearance of a telephone exchange, i.e., the Electrical Analogue developed by Dr. V. Paschkis at Columbia University.

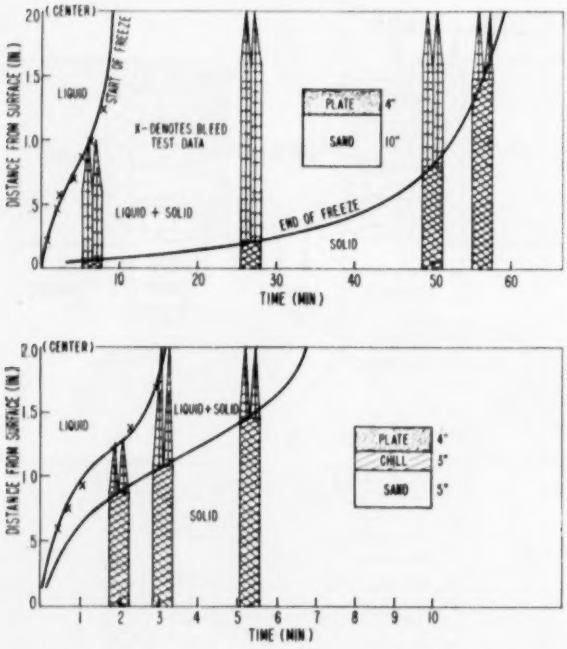


Fig. 2—Relation of Analogue freezing curves and "bleed" test data for sand and chill wall solidification of steel plates. Schematic dendrite structures indicate zone of mixed liquid and solid at various times.

There was a reason for this. Dr. Paschkis had demonstrated repeatedly to industry that heat transfer problems could be resolved by means of the Analogue. On the other hand, the only then available and used foundry technique for solidification studies, the "pour out" or "bleed tests" had repeatedly failed to provide the needed information. Clearly, it was a time to try something new. At that time direct solidification studies by means of thermal analysis methods which have been evolved since were not considered to be feasible.

In great part the work to date has related to establishing the nature of the solidification of metals. Proper risering, gating and mold practices depend on a knowledge of the manner by which metals solidify. In retrospect, "bleeding" or "pour out" tests provided rough approximations of the initial rates of freezing for certain metals such as steels. However, no information was provided as to the nature of freezing or of rates and times of final solidification. For metals such as irons or non-ferrous types it was not even possible to obtain reliable relative freezing rate information at initial stages. Figure 1 illustrates the bleeding test method and its shortcomings. Pour out at early and intermediate stages of solidification is illustrated schematically. The dendrites are drawn as single columnar structures for simplication. It is recognized that the mushy zone may, in many cases, consist of layers of dendrite crystals with various orientations, however, the degree of solidification (fraction of liquid and solid) is as represented by the schematic picturization of the skin growth process.

It is illustrated that the remaining skin represents the actual solid skin plus part of the "mushy" material comprising intermixed solid and liquid. Under certain conditions part of the mushy material is dislodged and bled along with the liquid, under other conditions, which will become clear in later portions of this report, the mushy condition attains sufficient coherency to prevent bleeding and pour out is not possible. At this stage of our knowledge two general opinions prevailed regarding results of bleed tests:

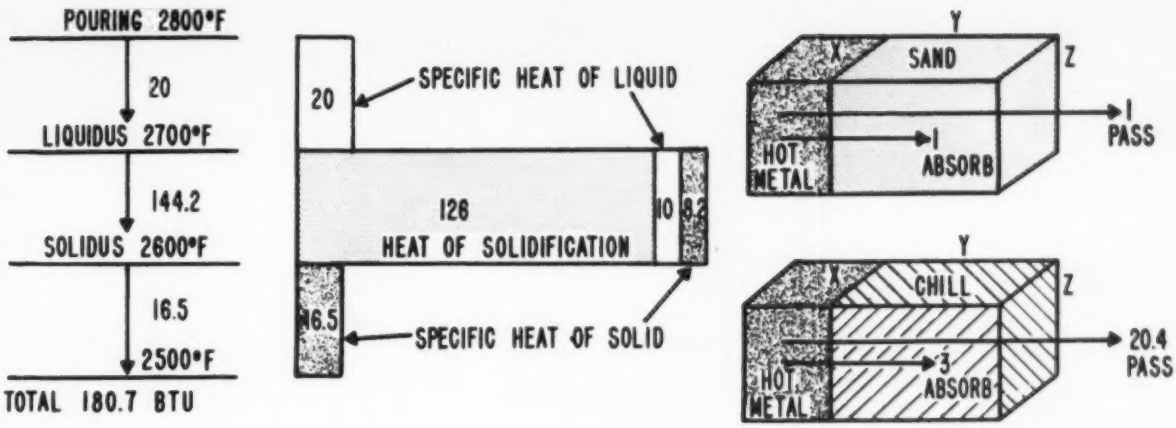
Opinions on Bleed Tests

1. It represented misleading information since the thermal gradients which existed in solidifying castings should result in producing solid, mixed liquid and solid, and liquid zones as demanded by the constitution diagram. (Minority opinion).

2. The data were accurate, i.e., at any time a given position was either completely solid or completely liquid which conclusion necessitated the further conclusion that the phase diagram did not apply to the "non-equilibrium" freezing of castings. (Majority opinion).

The first major application of the Analogue was aimed at resolving this question. The problem specifically concerned the determination of the nature of the solidification of steel plates of various thicknesses in comparison to bleed test data obtained by Clark at the Naval Research Laboratory. Two conditions of molding were used, sand and chill-backed by sand. Figure 2 illustrates the general nature of the results obtained by the Analogue and pour out methods. The Analogue answer was characterized by two freezing curves, one denoting the time of *first formation* of solid metal at various distances from the casting wall and the other the time of *complete solidification*.

The two curves indicated that freezing proceeded by the wavelike movement of a band of solidification (mushy zone) from the surface to the center. The pour test data (X points) characterize soldification as proceeding by the growth of a completely solid skin at rates equal to the rate of initial formation of solid as deduced by the Analogue. The pour-out test points were not carried beyond 0.6 distance to the center for the sand case and 0.8 distance for the chill case due to inability to bleed the castings beyond these respective times. Thermal analysis methods developed at Naval Research Laboratory at a later date have shown that the Analogue predictions were correct in all respects.



Figs. 3 and 4—Left: Heat liberated during cooling of 1 lb of steel from 100 F above liquidus to 100 F below solidus. Right: Relative ability to pass and absorb heat for sand and chill; cube of equal dimension.

By consideration of Fig. 1 it is evident that the pour out method should agree with the "start of freeze" curves of the Analogue. It is also evident that bleeding should not be possible shortly after the start of freezing reaches the 0.6 and 0.8 distance positions quoted above, inasmuch as the start of freezing progresses to the center very rapidly thus entrapping the remaining liquid and preventing further pour out. The width of the freezing bands and the shapes of the initial curves for the case of sand and chill also explain the reason for the ability to bleed to somewhat deeper positions in the case of the chill.

The two curves derived by the Analogue thus present a complete and accurate description of the course of freezing; the various shapes and rates which may be developed provide of wealth of practical information. In other words, these curves are the equivalent of the S curve information in that the rates and mode of transportation (liquid to solid) are defined graphically. Since the bleeding test data corresponded to points on the "start of freeze" wave of solidification, the time which was predicted as complete solidification of the casting by the bleeding tests actually represented the time at which solid *began* to form at the center. In the

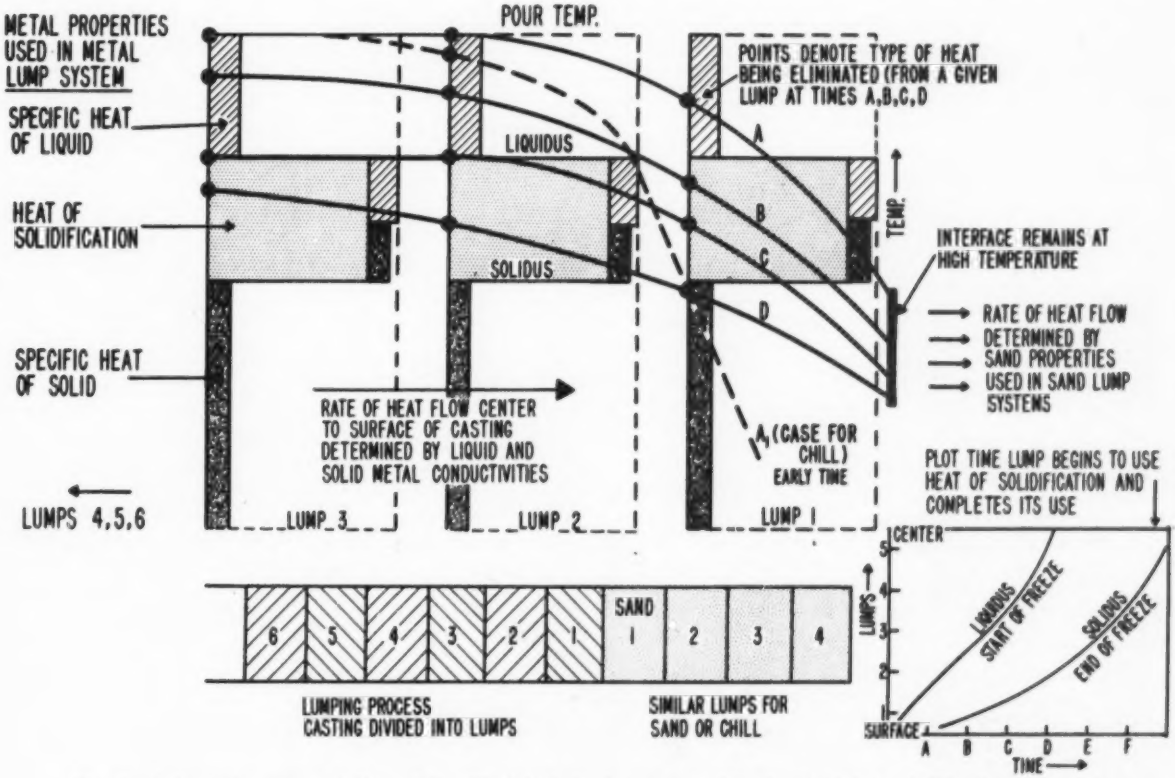


Fig. 5—Schematic representation of the Electrical Analogue procedure for studying solidification of metal.

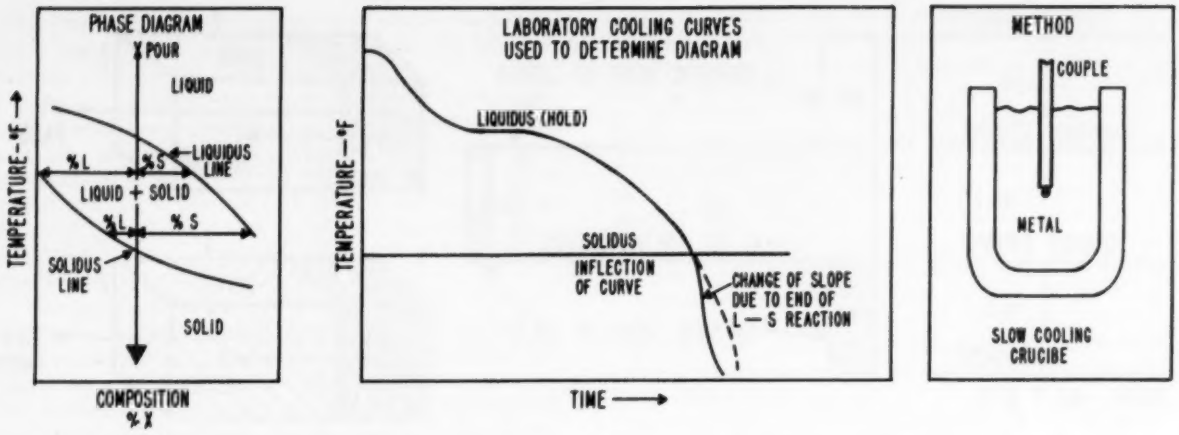


Fig. 6—Cooling curve method for determination of liquidus and solidus points to establish phase diagram.

case of the chill wall the casting completely solidified a short time afterwards, however, in the case of the sand casting solidification did not occur until a much later time. In the case of the 4-in. plate cast in sand (Fig. 2) the bleed tests were in error by a factor of six in the prediction of final solidification times; in the case of the chill castings the error entailed a factor of two.

Unfortunately the understanding of the mechanism of solidification at the time was not sufficiently advanced to permit the above deduction regarding the significance of the Analogue data. It was erroneously concluded that the "start of freeze" wave of the Analogue actually represented the end of feeding (hence, from a practical viewpoint a condition of final freezing) inasmuch as a check was obtained with the bleed experiments. The "end of freeze" curve was therefore ignored as of no significance and accordingly the work performed during the next few years related only to the "start of freeze" curve ("end of freeze" either not determined or not considered).

This, then unavoidable, error was unfortunate for we now know that the metal conditions and characteristics which are of concern to feeding to soundness, relative freezing rates of various sizes and shapes (risering problem), etc., are related to the "end of freeze" curve. The significance of this will be more evident with the discussion of the various sections of this report. It is now recognized that the Analogue correctly presented the course of solidification of the first casting problem which was presented and demonstrated the lack of reliability of bleeding tests. At the same time a completely new picture of the mechanism of solidification was unfolded.

In the discussions which follow, the subsequent Analogue studies will be discussed and compared with direct experiment, i.e., thermal analysis data to indicate the extent to which the Analogue data have been corroborated by research on the foundry floor. For this purpose the general scheme of approach of Analogue and thermal analysis methods will be discussed as introductory material.

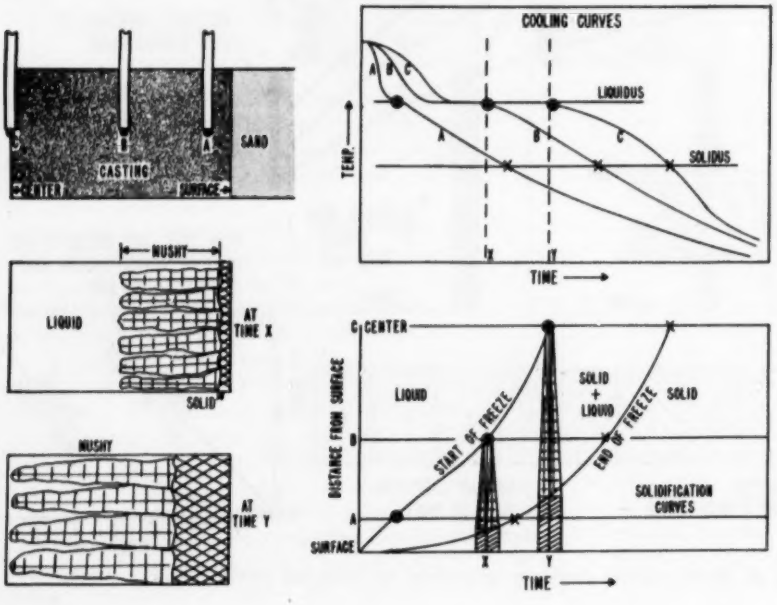


Fig. 7—Thermal analysis of solidification, illustrating case for sand cast steel. Thermocouples are placed at various positions in the casting and the individual cooling curves are analyzed to determine the times of "start" and "end" of solidification. A plot of these times (circles and X's) traces course of solidification.

It is not within the purpose of this report to provide a detailed description of the operation of the Electrical Analogue from a viewpoint of the actual make-up of the equipment; this has been presented in detail by Dr. Paschkis in the various reports which have been issued. In keeping with the interpretive plan of the present report, it is of interest to discuss the general approach to a casting problem by means of the Analogue. Briefly, the elements which determine the transfer of heat may be represented in terms of electrical elements as follows:

Thermal System (Casting)	Electrical System (Analogue)
Thermal Conductivity	Electrical Conductivity
Thermal Capacity	Electrical Capacity
Temperature	Voltage
Heat Flow	Current Flow

Before setting up an electrical system which is analogous to a casting thermal system it is necessary to know the material properties of the metal and of the mold material. This basic requirement provides certain practical difficulties for the thermal properties of the various metals are not always known exactly. One of the primary reasons for the emphasis on steel solidification during much of the initial work was the availability of reliable data for the thermal properties of this metal.

It should be noted in this respect that the Analogue may be used to "work backwards", i.e., to determine its own constants by adjustments to match the solidification conditions determined by a direct method such as thermal analysis. This means that the unknown constant is varied until the final answer matches the solidification data by direct experiment; the constant thus determined may then be used for future work. Table 1 presents a listing of the thermal constants adopted for steel and sand.

TABLE 1—THERMAL CONSTANTS FOR STEEL AND SAND

	Property	Solid		Liquid	Units
Steel	Specific Heat	.165		.200	Btu/lb, °F
	Density	468		450	lb/cu ft
	Heat of Fusion		126		Btu/lb
	Conductivity	18.4		9.2	Btu/sq ft, hr, °F
Sand	Specific Heat	.28			Btu/lb, °F
	Density	93.6			lb/cu ft
	Conductivity	.9			Btu/sq ft, hr, °F

The freezing range for most of the experiments was taken as 2700-2600 F, this corresponds roughly to a 0.60% C steel (2720-2575 F). This choice was made originally in Analogue solidification work related to steel ingots and was "borrowed" when the A.F.S. work was started at the default of a better suggestion at the time. Actually, the 100 F freezing range is a good average for the freezing range of steels within the practical limits of 0.20 to 0.60% C and the difference in liquidus temperatures between these steels is not sufficient to introduce major errors in the results of the heat transfer problem.

The basic elements of a typical Analogue approach are illustrated schematically in Figs. 3, 4 and 5. Given the constants in Table 1 it is recognized that the solidification of a unit mass must be accompanied by the removal of the various heats shown in Fig. 3; it is evident that the heat of solidification is by far the largest block of heat which must be removed. Accordingly, it follows that for any given rate of heat removal by the mold the time of cooling through the solidification range should be longest, since approximately 7-8 times more heat has to be removed to cause a given temperature drop than at temperatures above or below the solidification range.

The rates at which the heat is removed from the casting depend on the thermal characteristics of the mold wall. The thermal constants of the two materials indicate, Fig. 4, that (assuming equal temperature gradients) in a given time period a unit volume of chill passes 20.4 times as much heat and absorbs 3 times as much heat as a similar volume of sand. Obviously, the sand should be expected to behave as a mildly insu-

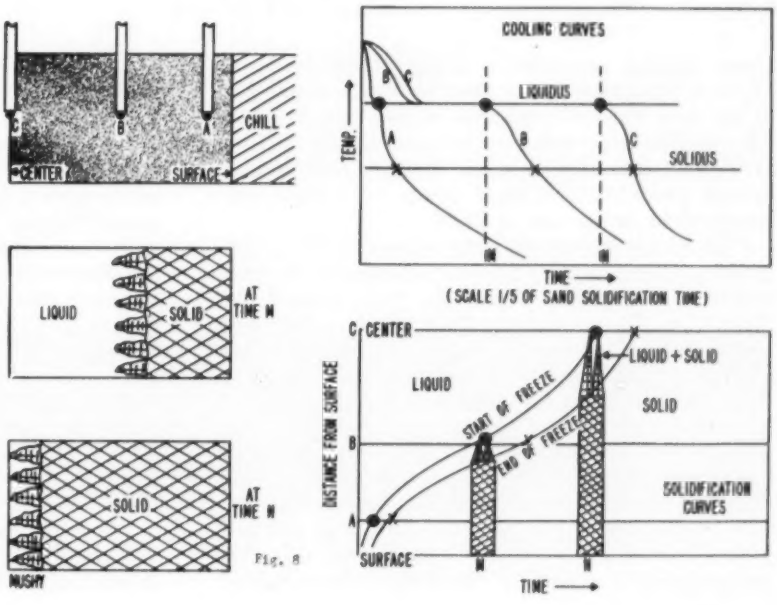


Fig. 8

Fig. 8—When steel is cast against a chill a thermal analysis of solidification looks like this. Note the "narrow band" freezing in comparison to the "broad band" freezing observed for sand (Fig. 7). This is due to steeper thermal gradients developed in the casting as the result of the faster heat extraction of the chill.

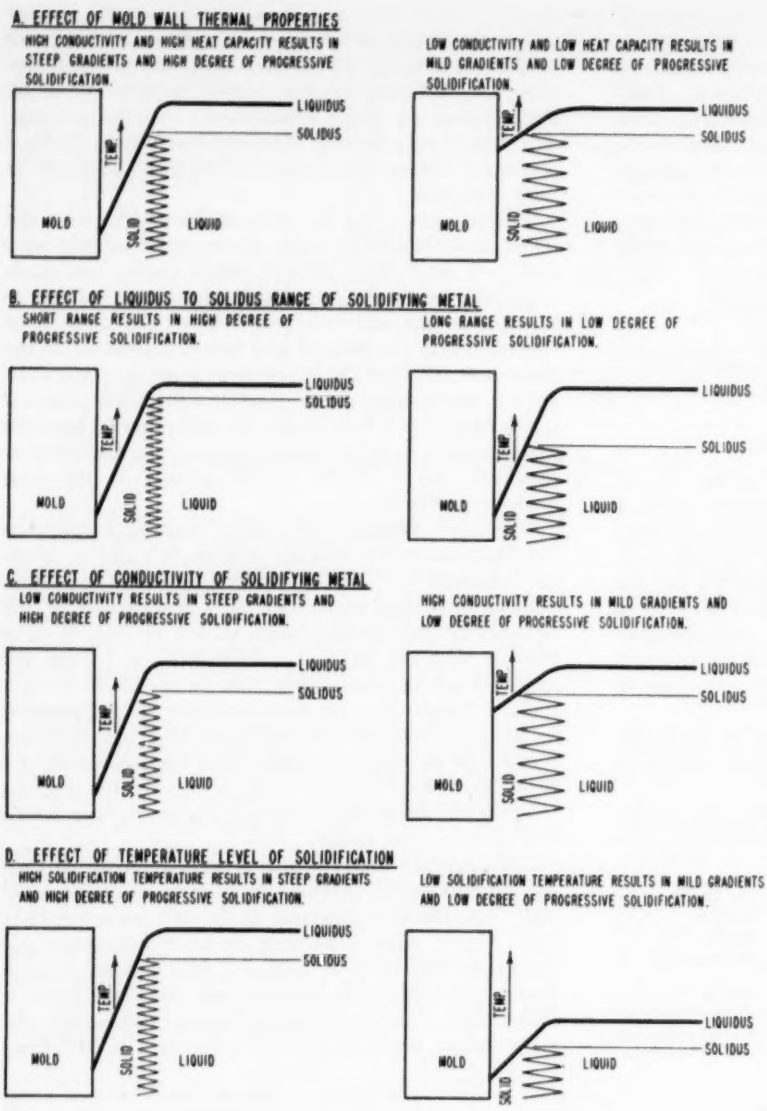

A. EFFECT OF MOLD WALL THERMAL PROPERTIES
HIGH CONDUCTIVITY AND HIGH HEAT CAPACITY RESULTS IN STEEP GRADIENTS AND HIGH DEGREE OF PROGRESSIVE SOLIDIFICATION.
LOW CONDUCTIVITY AND LOW HEAT CAPACITY RESULTS IN MILD GRADIENTS AND LOW DEGREE OF PROGRESSIVE SOLIDIFICATION.
B. EFFECT OF LIQUIDUS TO SOLIDUS RANGE OF SOLIDIFYING METAL
SHORT RANGE RESULTS IN HIGH DEGREE OF PROGRESSIVE SOLIDIFICATION.
LONG RANGE RESULTS IN LOW DEGREE OF PROGRESSIVE SOLIDIFICATION.
C. EFFECT OF CONDUCTIVITY OF SOLIDIFYING METAL
LOW CONDUCTIVITY RESULTS IN STEEP GRADIENTS AND HIGH DEGREE OF PROGRESSIVE SOLIDIFICATION.
HIGH CONDUCTIVITY RESULTS IN MILD GRADIENTS AND LOW DEGREE OF PROGRESSIVE SOLIDIFICATION.
D. EFFECT OF TEMPERATURE LEVEL OF SOLIDIFICATION
HIGH SOLIDIFICATION TEMPERATURE RESULTS IN STEEP GRADIENTS AND HIGH DEGREE OF PROGRESSIVE SOLIDIFICATION.
LOW SOLIDIFICATION TEMPERATURE RESULTS IN MILD GRADIENTS AND LOW DEGREE OF PROGRESSIVE SOLIDIFICATION.
LIQUIDUS
SOLIDUS
TEMP
MOLD
SOLID
LIQUID

Fig. 9—Mold wall thermal properties, as illustrated in Fig. 7 and 8, are not the only factors in determining the broadness of freezing bands. This illustration shows how the mold wall and three additional factors influence the progressive nature of solidification.

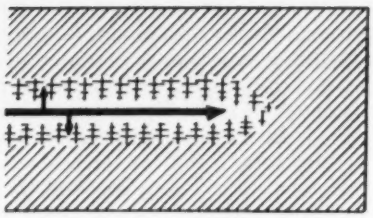


Fig. 10a—Effects of freezing band conditions on ease of feeding to soundness are shown in Fig. 10a and 10b. This shows a free channel condition. Solidification is strongly progressive, mushy zone is narrow, feeding is easy.

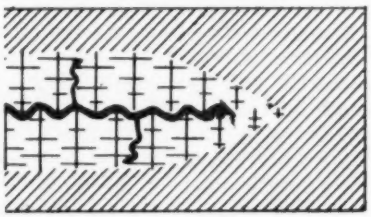


Fig. 10b—Behavior of metal in a hindered channel condition. Solidification is only slightly progressive while the mushy zone is wide and feeding is difficult.

lating material compared to a chill. It will be shown in the discussions to follow that the relative differences in the heat removal capacities of sand and chill are somewhat less than indicated by a simple consideration of thermal constants since the thermal gradient conditions which exist in sand molds are considerably steeper than in the case of chills.

Figure 5 presents an idealized picture of the solidification problem as "set up" on the Analogue electrical system. The casting and mold are broken down into "lumps" or discrete sections. Each section is characterized by having electrical properties equivalent to the various "blocks" of heat. Thus, cooling in the range above the liquidus necessitates the removal of the heat (stored current) denoted by the specific heat block, and so forth. The properties of the lumps in the mold side determine the rate at which heat can move out of the casting. In the sand case (shown) the thermal resistance (electrical resistance) in the sand side is high and heat passage (current flow) is slow. This permits a gradual and progressive removal of the "highest temperature" form of heat from each of the lumps in turn. Thus, the block of heat which represents superheat of the first lump leaks out to the mold system, then the heat of solidification begins to move out.

During this time the superheat present in lump 2 will tend to flow into lump 1—its rate of flow is determined by the thermal conductivity of the castings (electrical conductivity between lumps). In the case of the sand mold which withdraws heat slowly from lump 1 there is considerable time for lump 1 to lump 2 heat flow to occur, then lump 3 to 2, etc. This means that superheat will be eliminated in all lumps before very much heat of fusion (indicating solidification) flows from lump 1. With superheat entirely eliminated the temperature gradient conditions (voltage conditions in Analogue) are as shown in curve C. The process is repeated in the heat of solidification range, each inner lump transfers heat to the next outer lump which is at a lower temperature (voltage) condition. The higher the conductivity of the metal and the slower the passage of heat to the mold, the more equal will be the tem-

perature (voltage) gradient curves which traverse the lump system.

Curve D represents a typical case for casting sand system; it is indicated that at the time lump 1 is completely solid (all heat of solidification removed) extensive solidification has occurred in the inner lumps. If the sand mold is replaced by a chill, very fast heat transfer from the casting results. This means that the heat of lump 1 is literally "ripped" out of it; since very little time is allowed for heat flow from lump 2 to lump 1, etc., a curve such as A1 is developed at very early times. This signifies that in extreme cases lump 1 may be completely solidified before the superheat of lump 2 is removed. The process of heat removal from the inner lumps slows down with time, however, heat passage from casting to chill remains sufficiently fast to result in essentially a block by block freezing rather than several blocks freezing in unison as in the case of sand; compare chill and sand cases of Fig. 2.

This mechanism of solidification from sand and chill walls has been shown to be correct by thermal analysis, gradient curve studies, as will be described. The Analogue data of the starting and ending of solidification of the various positions in the casting are plotted as "start" and "end of freeze curves", shown on the lower right hand corner of Fig. 5. The plot represents the time at which heat of solidification *first begins to pass* from a given lump and the time the *process is completed* and the lump has completely lost all of this heat.

The process of thermal analysis requires discussion, inasmuch as it has been shown to independently recognize the same features of solidification as the Analogue. Basically, thermal analysis is a lumping process also, in that thermocouples are used to determine cooling curves of small lumps of metal at various positions in the casting and the results are analyzed in integrated fashion. This method is basic, inasmuch cooling curves are used to determine phase diagrams (Fig. 6).

It should be observed that such cooling curves do not represent truly equilibrium freezing but freezing under conditions of slow cooling; unless thermal gradients were established in the crucible solidification would never occur. These conditions are not unlike the cooling conditions of heavy sections in sand molds. In fact, if allowance is made for the effect of alloy elements, the actual undercooling of liquidus and solidus points observed in practical castings, even against chills is not greater than 10 F. This should not be surprising for it is well known that metals are highly difficult to undercool unless of extremely high purity (devoid of all small foreign particles, gases, etc.) and the container is of glass-like smoothness.

Figure 7 illustrates a typical thermal analysis approach to the problem of determining the mechanism and rate of solidification of a sand casting. Cooling curves are obtained at various surface-to-center positions across the casting (a number of positions such as shown in Fig. 7) and the time the first drop below the liquidus and solidus temperatures (corresponding to starting and ending of the flow of heat of fusion) are

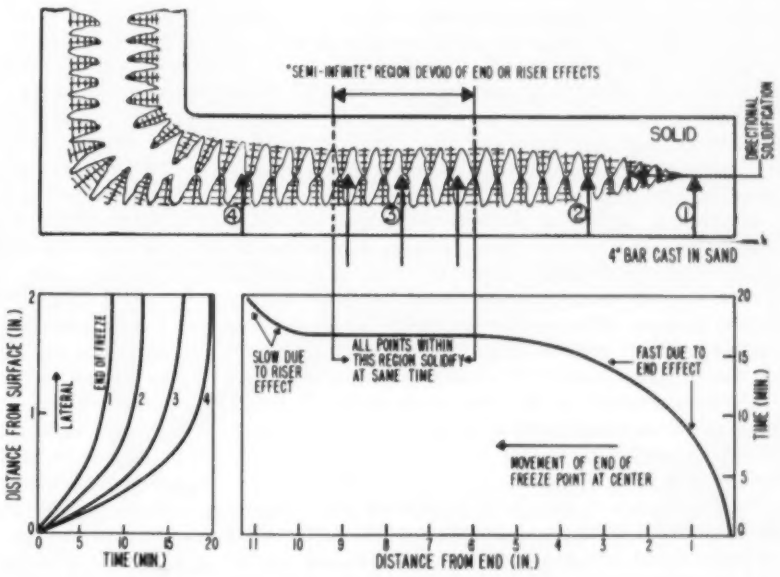

"SEMI-INFINITE" REGION DEVOID OF END OR RISER EFFECTS
SOLID
DIRECTIONAL SOLIDIFICATION
4" BAR CAST IN SAND
DISTANCE FROM SURFACE (IN.)
LATERAL
END OF FREEZE
TIME (MIN.)
SLOW DUE TO RISER EFFECT
ALL POINTS WITHIN THIS REGION SOLIDIFY AT SAME TIME
FAST DUE TO END EFFECT
MOVEMENT OF END OF FREEZE POINT AT CENTER
DISTANCE FROM END (IN.)
TIME (MIN.)

Fig. 11—Mechanism of directional solidification represented by varying rates of solidification at various positions in the casting. For simplification, all solidification curves presented in this report are specific to semi-infinite regions. At other positions there are differences in rate but not in the nature of solidification.

Fig. 12—Radiograph showing center-line shrinkage in a cast steel bar. The shrinkage is developed as the result of lateral solidification proceeding at the same rate over this region. Riser was at right end.

taken as indicating the "start of freeze" and "end of freeze" at the respective locations. The cooling curve for the center couple establishes distinct liquidus and solidus temperatures so that it is not necessary to know the solidification range of the alloy in advance to deduce its nature of solidification. Fig. 8 presents the case for a chill casting.

Comparison of the cooling curves of Fig. 7 and 8 shows that solidification occurs in a narrow band in the case of the chill wall which removes heat at a fast rate and in a very broad band in the case of the sand mold which removes heat slowly. The progress of solidification and the relative portions which are liquid, semi-solid or solid are denoted in the schematic casting diagrams and in the solidification curve diagrams. It is obvious that the solidification curves present a clear picture of the process and rate of solidification from the casting wall to the center of the section. The exact shapes of the solidification curves both as to rates of progression of the "start" and "end of freeze" curves and the width of the solidification band (distance between the two curves at any given time) are determined by the thermal properties of the casting and of the mold materials.

Two Factors Influence Freezing Mechanism

Figure 9 presents a summary of the factors which have been deduced to affect the width of the solidification band (width of mushy zone) developed during solidification. The data which support this generalized introductory picture of mold and metal effects will be discussed in detail in the following sections. The point to be made at this stage of the discussion is that the mechanism of solidification is determined *both by the metal and the mold* and that a great variety of conditions result from the great variety of combinations to be met in practice. However, the specific nature of freezing for a given metal in a given mold system is accurately defined by the solidification curves.

A number of practical deductions may be made from such information. For example, it may be deduced that the feeding of metal which solidifies in such a manner as to develop broad "mushy" regions should be more difficult than for metals which develop narrow "mushy" regions (Fig. 10). Solidification curves for the various commercial metals and mold materials could be assembled in the form such as the "S Curve Atlas for Transformations of Steels" and used as reference by foundrymen in the same manner that S curves are used by heat treaters.

In this respect, it should be recognized that S curves are specific to isothermal transformation and certain interpretations are required for practical use in the case of continuous cooling transformations typical of heat treatment cycles. In the case of solidification curves it is necessary to specify a fixed condition for which the *time scale* is strictly applicable; this condition is that heat flow is occurring only in the direction perpendicular to the mold wall, i.e., there is no heat flow along the axis of the casting (to casting ends) or into the casting (from the riser).

The significance of this stipulation is illustrated in Fig. 11 for the case of a long bar casting. Such a casting may be divided into three zones: (1) a zone which loses heat both in the direction of the side surfaces and in the direction of the casting end; (2) a zone termed "semi-infinite" which loses heat only in the direction of the side surfaces; and (3) a zone next to the riser which is supplied with additional heat flowing from the riser. In simple terms it may be said that the center zone does not know that a riser or a casting end exists. As the bar is made longer the lengths of zones 1 and 3 remain fixed, however, zone 2 becomes longer by the exact amount that the casting is made longer. Obviously, if the casting is made shorter zone 2 disappears.

It should be noted that the nature of solidification is the same in all three zones (and also the riser) the differences in the three zones are only in the rates of solidification. This actually describes the process of "directional solidification", i.e., the directional freezing from the casting end to the riser due to the varying rates of *lateral* solidification which exist along the length of the bar. "End of freeze" solidification curves 1, 2, 3, 4 illustrate the relative rates of solidification (lateral) at various positions along the bar; inasmuch as all positions in the semi-infinite zone freeze at the rate of curve 3, solidification is not directional here.

The movement of the "end of freeze" point along the centerline of the bar denotes the features of directional solidification. It should be noted that since freezing occurs at the same rate in the semi-infinite zone, feeding is not possible at the last stages of solidification. This results in centerline shrinkage at this area; zones 1 and 3 will remain sound (Fig. 12). Note also, that the rate of final freezing in a lateral direction is very fast (several inches per minute) in the last ½ in. at the center. This means that feed metal has to move in along choked-up, tortuous interdendritic paths at very high rates to compensate for the last amounts of liquid-solid shrinkage. The extent of the mushy zone (solidification band width) which exists during the last stages of freezing in great part determines the difficulty of movement of the liquid metal. Because of this difficulty a portion of zones 1 and 3 may develop shrinkage for metals which develop extensive mushy freezing despite the fact that solidification was directional.

Solidification Curves Explain Feeding

The point to be made is that the solidification curves of the various metals provide the necessary information to deduce the relative feeding difficulties. It is also to be noted that solidification curves which relate to semi-infinite casting sections (long bars, plates, cylinders, etc.) may be interpreted to faster or slower solidification rates depending on the position in the casting which is of interest, i.e., depending on the nearness to risers or casting edges. This is the practical interpretation of the solidification curves which the foundryman must make in considering practical problems.

To date all of the published work performed with Analogue and to be discussed in this paper relates to semi-infinite positions. A paper to be presented at the 1953 A.F.S. convention will cover the first case of end effects and demonstrate the relative increase in solidification rates in a short cylinder as compared to a very long one.

The last half of this interpretative report on A.F.S.-sponsored heat transfer research will appear in the March issue of *American Foundryman*.

Now 3 fine FANNER CHILLS

designed to meet particular requirements

for *Greater* chill efficiency... *Better* metal flow... *Sounder* castings

TYPE 1 SUPERCHILLS (patented)

TYPE 2 SUPERCHILLETS (patented)

MADE IN A WIDE RANGE OF TYPES AND SIZES

wrong square-headed chill nails do not conform to flow of metal, allow "pockets" and blow holes to form, and cause defects in castings.

● Now . . . Fanner offers three special types of FINE FANNER CHILLS designed to result in better, sounder castings every time. Fanner Superchills and Superchillets illustrated above prove superior in the pouring operation because they are engineered to the smallest detail. Surfaces are correctly tapered, gases are free to flow along surfaces as fast as generated before they can be pocketed. These new chills provide: better surfaces for molten metal to contact, and more chilling volume per pound. They are not "off-shoots" or by-products but are scientifically designed to produce proper chilling at lowest cost without "blows" . . . with "kicking-away" . . . and without sharp shoulders. SUPERCHILLS and SUPERCHILLETS are available in a wide range of sizes and shapes. Write for samples and prices today.

right correctly tapered head of new FANNER chill nails conforms to flow of metal, eliminating pockets, allow gases to escape and result in sound castings.

See 3 on other side

THE FANNER MANUFACTURING COMPANY

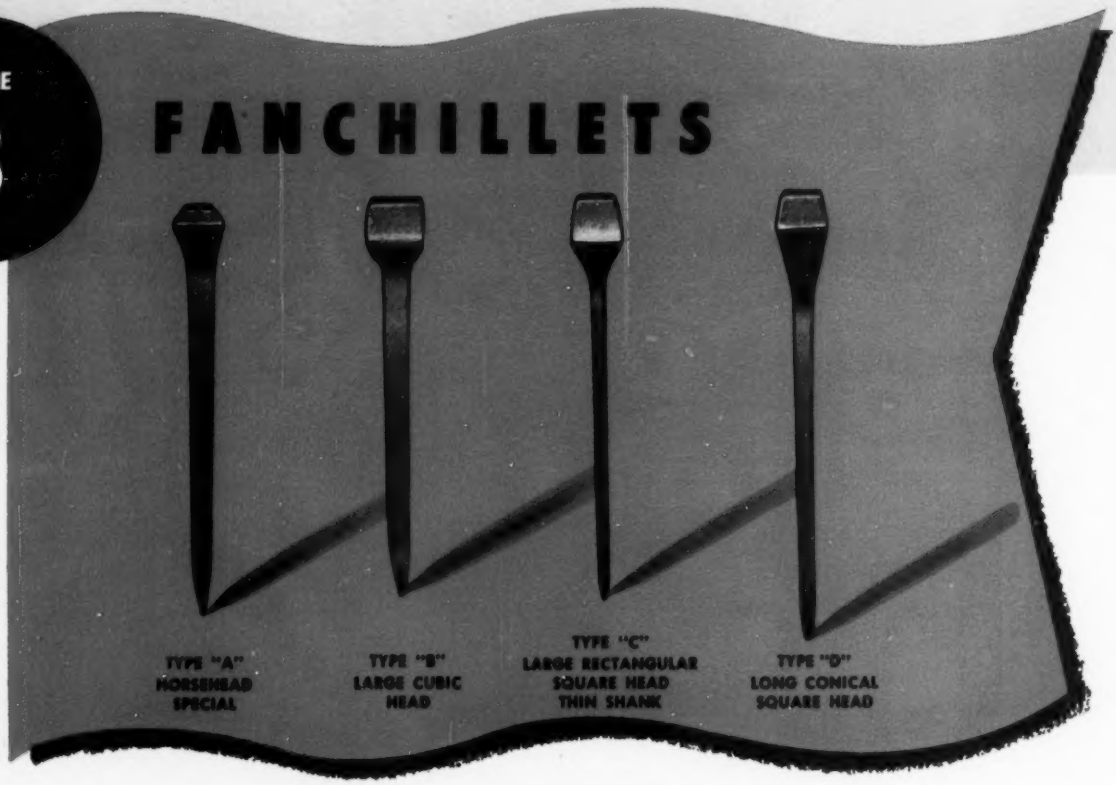
designers and manufacturers of Fine Fanner Chills

BROOKSIDE PARK CLEVELAND 9, OHIO

fine FANNER CHILLS

TYPE **3**

FANCHILLETS



Fanner Fanchillets are another type of Fine Fanner Chills which provide greater chilling efficiency at lower cost through engineering design. Instead of the conventional square head, the Fanchillet has its sides tapered toward the top to properly chill a given area. Thus, gases are free to flow along surfaces as fast as generated before they can be pocketed; metal completely envelopes the head and proper cooling is effected at the same time . . . so that casting is free from otherwise produced defects. In addition, these Fine Fanner Chills cost you less per pound than the price per pound for which you sell the finished casting.

Fanchillets are available in a wide range of sizes and shapes. Write for samples and prices today. A great variety of other types of Fine Fanner Chills are shown in the new Fanner Chill Catalog. Send for your copy.

See 1 and 2 on other side

THE FANNER MANUFACTURING COMPANY

designers and manufacturers of Fine Fanner Chills

BROOKSIDE PARK CLEVELAND 9, OHIO

▶ Conference programs: Southeastern and FEF

Southeastern regional

Final regional foundry conference of the 1952-53 series, the Southeastern is to be held at the Tutwiler Hotel, Birmingham, Ala., February 19 and 20. Sponsored by the Birmingham and Tennessee Chapters and the University of Alabama Student Chapter, the conference is under the chairmanship of Fred K. Brown of Fred K. Brown, Inc., Birmingham. Biddle W. Worthington, McWane Cast Iron Pipe Co., Birmingham, is program chairman.

THURSDAY, FEBRUARY 19

9:00 a.m. . . REGISTRATION. Lobby of Tutwiler Hotel.
10:00 a.m. . . . *"Effect of Gating Design on Casting Quality."* Technical talk and motion picture. S. C. Massari, Technical Director, A.F.S.
11:00 a.m. . . *"Problems Encountered in the Production of Thin-Walled Castings."* Oscar J. Stoesser, Crane Co., Chattanooga, Tenn.
12:30 p.m. . . LUNCHEON. Speakers: Mayor Cooper Green; Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., Vice-President of A.F.S.; and Wm. W. Maloney, Secretary-Treasurer of A.F.S.
1:45 p.m. . . *"Shell Molding,"* Richard Herold, Borden Co., New York.
3:15 p.m. . . *"Mechanical equipment for Shell Molding."* Technical talk and movie. Floyd R. Schulz, Mechanical Handling Systems, Inc., Detroit.
4:15 p.m. . . *"The Invisible Shield."* Technical talk and movie. L. C. Beers, Claude B. Schneible Co., Detroit.
8:00 p.m. . . ENTERTAINMENT.

FRIDAY, FEBRUARY 20

9:00 a.m. . . PLANT VISITATIONS.
1:30 p.m. . *"Developments to Date in Ductile Iron,"* Keith D. Millis, International Nickel Co, New York.
3:10 pm. . . *"Effects of the Carbon Equivalent on the Properties of Cast Iron,"* Warren C. Jeffery, Edwin E. Langer, Jr., and Chulan D. Azizi, University of Alabama.
4:30 p.m. . . *"Cupola Operation,"* J. Robert Cardwell, Stockham Valves & Fittings, Inc., Birmingham.
7:00 p.m. . . BANQUET. Speaker: Hugh Comer, Chairman of the Board, Avondale Mills, Birmingham.

FEF conference

The 6th annual meeting and conference of the Foundry Educational Foundation will be held in the Hotel Cleveland, March 11 and 12, in Cleveland. Meeting together will be the Technical Advisory, University Advisory, and Industry Advisory Committees of FEF. For the first time the conference includes the annual meeting of the Foundation, at which President Marion J. Allen, American Steel Foundries, Chicago, will chart the future development of FEF and its program in his report.

WEDNESDAY, MARCH 11

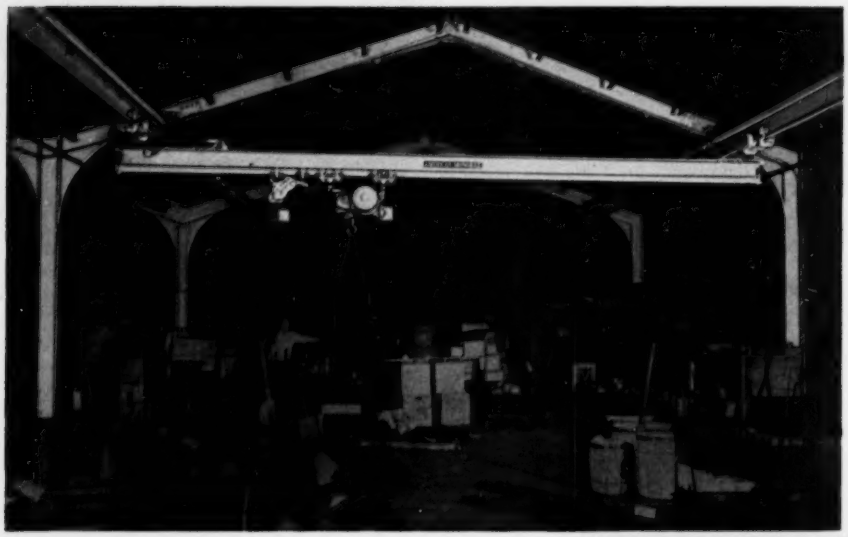
9:30 a.m. . . OPENING ADDRESS.
"Present and Future of Cast Metals." Frank G. Steinebach, *Foundry.*
USE OF ENGINEERING TALENT IN FOUNDRIES.
"Metallurgical Engineer," C. W. Briggs, Steel Founders' Society of America.
"Mechanical Engineer," B. J. Yearley, National Malleable & Steel Castings Co., Cicero, Ill.
"Industrial Engineer," Tom W. Curry, Lynchburg Foundry Co., Lynchburg, Va.
12:30 p.m. . . . LUNCH.
1:30 p.m. . . RECRUITING AND TRAINING.
"What is Engineering Education," Dean Eric Walker, Pennsylvania State College.
"Recruiting for the Foundry Industry," F. Lynn Cason, Purdue University.
"The First Five Years of Professional Development," Karl McEachron, General Electric Co., Erie, Pa.
"A Small Foundry Hired Me," Robert W. Lundberg, Gibson & Kirk Co., Baltimore, Md.
"Principles of Use by the Foundry Industry," George K. Dreher, FEF.
4:00 p.m. . . ANNUAL MEETING OF FEF.
6:30 p.m. . DINNER.
"Use and Abuse of Discipline," J. Elliott Janney, Rohrer, Hibler & Replogle, Cleveland.

THURSDAY, MARCH 12

9:00 a.m. . . UNIVERSITY ACTIVITY.
"Film", Warren C. Jeffery, University of Alabama.
"Field Problems," C. C. Sigerfoos, Michigan State College.
"Demonstrations in Wax," David Ekey, Pennsylvania State College.
"Baby Cupolas—Survey Results," Daniel S. Eppelsheimer, Missouri School of Mines.
"Production Costs," Clyde E. McQuiston, Ohio State University.
"Light Metals in the Laboratory," L. F. Mondolfo, Illinois Institute of Technology.
"Course and Laboratory Developments," R. A. Flinn, University of Michigan.
"Books," Clyde M. Adams, Massachusetts Institute of Technology, and representative of University of Wisconsin.
ATTRACTING STUDENTS.
D. C. Williams, Ohio State University, Howard F. Taylor, MIT, C. C. Sigerfoos,
MSC, and Fred Westermann, University of Cincinnati.
12:30 p.m. . . LUNCH.
1:30 p.m. . CONFERENCE SUMMARY.

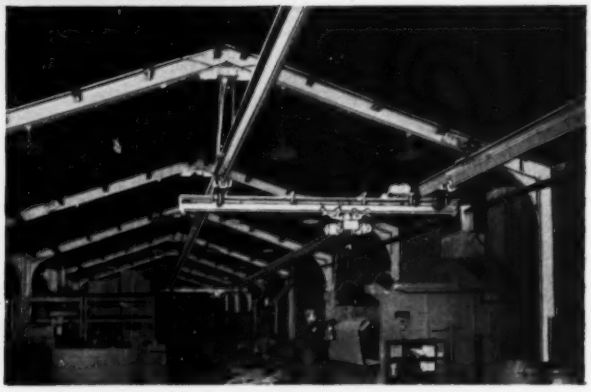
▶ Display spreads foundry knowledge

Keeping foundry developments in industrial engineering before students at Ohio State University is the function of this bulletin board. Articles and bulletins are displayed under such headings as plant layout, safety, standards & methods, personnel & training, costs, and quality control. Here Dr. D. C. Williams (right) discusses with student William Cox an *American Foundryman* article on plant layout.

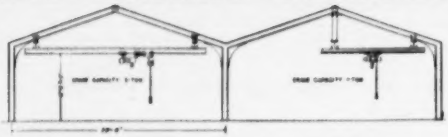


Photos courtesy of The Thew Shovel Co., Lorain, Ohio.

Rigid frame structure by The Steelcraft Mfg. Co., Rossmoyne, Ohio.



AMERICAN MONORAIL EQUIPS RIGID FRAME BUILDINGS



with flexible overhead crane service

Don't let crane requirements stymie your consideration of rigid frame buildings. Packaged buildings not only provide definite savings in construction costs and erection time but can be equipped with crane service over the entire area. American MonoRail cranes up to 5-ton capacity are available for entire span or half span operation. If you are planning plant expansion and considering rigid frame type construction, be sure to include American MonoRail cranes. Our engineers will gladly consult with you and show you cost and space saving advantages, in addition to original installation savings.

Write us today.

THE AMERICAN MONORAIL COMPANY

13122 ATHENS AVENUE **CLEVELAND 7, OHIO**

foundry tradenews

Alloys & Products, Inc., New York, is now producing and marketing Everdur ingot for the foundry industry under a licensing agreement with **American Brass Co.**

Research Corp., Bound Brook, N. J., manufacturer of Cottrell electrostatic precipitators for industrial gas cleaning, has opened a new divisional office in Pittsburgh. H. L. Richardson, divisional sales manager will head the new office, which will be located in the Grant building. The new office will handle sales and engineering for West Virginia and the western section of Pennsylvania.

Hewitt-Robins, Inc., Stamford, Conn., recently opened a million-dollar addition to its Buffalo, N.Y., conveyor-belt plant. The new facilities will increase production capacity by about 40 per cent.

International Graphite & Electrode Div. Speer Carbon Co., St. Marys, Pa., has installed a rotary calciner at their Niagara Falls, New York, plant for the production of graphitized carbon electrodes and other carbon products. The coke calcined in the new equipment will be used in the manufacture of electrodes and anodes for the metallurgical and chemical industries as well as to supplement the supply of raw material used in the main plant.

Superior Steel and Malleable Castings Co., Benton Harbor, Mich., and **Brad Foote Gear Works, Inc.,** Cicero, Ill., have appointed **Gibney-Coffman Corp.** regional representative. Gibney-Coffman recently moved to new and larger offices at 2107 Kensington Ave., Buffalo, N. Y.

Production of alloys has started at the new, $2,500,000 plant of **Vanadium Corp. of America** near Cambridge, Ohio. The plant is located on a 120-acre site about 100 miles from the company's new alloy producing plant at Graham, W. Va. The facilities include three low frequency induction furnaces previously operated at the company's leased Chester, Pa., plant which was returned to the U. S. Government for re-activation by the Air Corps.

Reynolds Metals Corp., Louisville has announced the appointment of **Barth Smelting Corp.,** 99 Chappel St., Newark, N. J. as distributor of aluminum pig and ingot products. Bart Smelting will serve the foundry industry in the New York area by offering quick delivery from stock.

Cerium Metals Corp., New York, has appointed Ohio Ferro Alloys Corp., Canton, their exclusive sales representative to the iron and steel industry. The Ohio firm will represent Cerium through their regular sales and service staffs in Chicago, Detroit, Pittsburgh, Tacoma, Seattle, Los Angeles, San Francisco, Birmingham, and Minneapolis.

SPO Inc. and **Shellmold & Machine Co., Inc.,** N. Y. have completed an agreement under which SPO's manufacturing and distribution facilities will become available to Shellmold for the production and distribution of Shellmold's complete line of shell molding machinery and auxiliary equipment.

President Eisenhower's bronze desk plate is the gift of Chicagoan H. A. Cooper, president of Architectural Bronze & Aluminum Corp. It was presented by Chicago policeman Louis Swee, the President's bodyguard during the 1952 campaign. Mr. Cooper gave similar desk plates to Presidents Roosevelt and Truman.

American Wheelabrator & Equipment Corp., Mishawaka, Ind., has moved its district office to 53 Newark Street Bldg., Hoboken, N. J. Telephones are Hoboken 2-8550 and 2-8551.

Manufacture of custom-designed conveying and processing machinery has been put on a straight-line production basis in the new 300,000 sq ft plant, designed and built for **Link-Belt Co.** by Austin Co. at Colmar, Pa. The plant is Link-Belt's 17th.

U. S. Reduction Co., Chicago, announces the formation of a new, wholly owned, subsidiary company, the **USCO Plate Corp.** The subsidiary which will produce cast aluminum tool and jig plate is located at East Chicago, Ind. Plate will be produced in thicknesses from ½ in. to 4 in. and in size 48 in. by 96 in. While USCO plate will be used in the larger size primarily by the aircraft industry, smaller sizes in all thicknesses will be available for such uses as cope and drag plates, core blower plates and match plates.

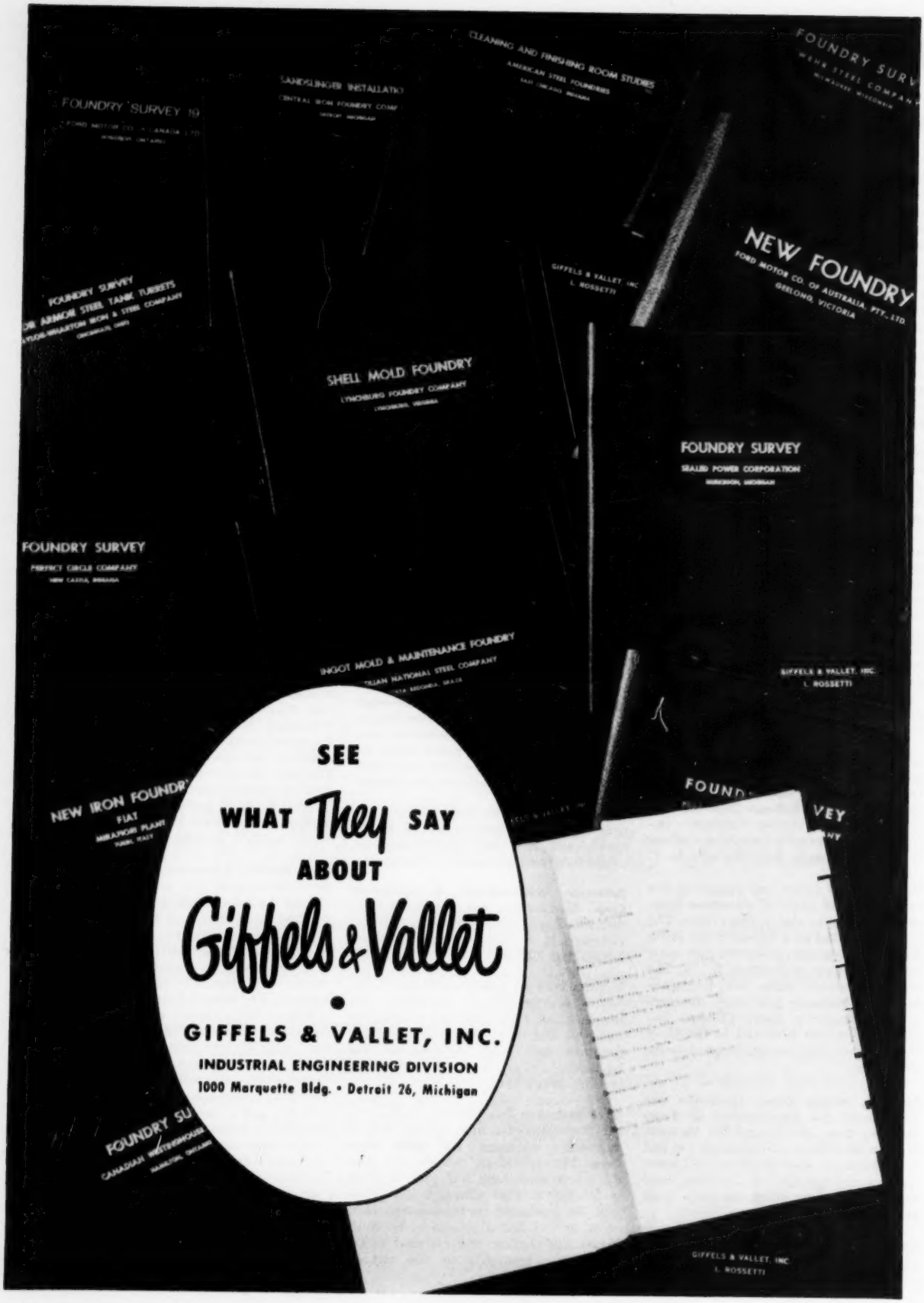
Dalton Foundries, Inc., Warsaw, Ind., producers of malleable and gray iron castings, have a new building. Construction of the one-story structure is steel frame, with a built-up roof deck and corrugated asbestos siding. Floor area is 7,200 sq ft.

A plan for the acquisition of the assets and business operations of **Doehler-Jarvis Corp.** by **National Lead Co.** has been announced. The business will be operated as a division of National Lead. Doehler-Jarvis, a major producer and finisher of die castings, has plants at Grand Rapids, Mich., Chicago, Toledo, Batavia, N. Y., and Pottstown, Pa. New plant facilities include a new die casting and electroplating plant and an armor plate production unit at Grand Rapids and a new die casting unit at Pottstown. Doehler-Jarvis Corp. has now under construction the largest die casting machine ever built. It will produce aluminum castings weighing up to 75 lb or zinc castings weighing up to 200 lb.

Meehanite Metal Corp. has purchased a building at New Rochelle, N. Y., and is now installed in the new headquarters. In addition to complete offices for the Meehanite staff, the building includes enlarged laboratory facilities for experimental melting, chemical and physical testing, and photomicrographic studies.

Michigan Steel Casting Co. has opened its new Whitehall Precision Casting Div., Whitehall, Mich. The plant represents the culmination of eight years of research in the investment casting process. The new division will enable Michigan Steel to produce parts for industrial and aircraft fields in greater quantities and under closer control dimensionally and metallurgically than heretofore.

Ferro Machine & Foundry, Inc., Cleveland producers of gray iron castings, has purchased the **John Harsch Bronze & Foundry Co.** The move is part of Ferro's product diversification program, according to Ferro President Ernest M. Knapp, and gives the parent company an interest in the fields of aluminum, bronze and brass castings. The Harsch foundry was established by John Harsch and sons in 1914 and incorporated in 1918. For many years the company concentrated almost entirely on architectural and ornamental metal work. In recent years it expanded into the permanent-mold casting of aluminum, and is one of the few foundries capable of producing aluminum castings in the large sizes necessary for the government's atomic energy program. The company will retain its name and methods of operation with Knapp becoming president, George N. Wright, general manager, and the brothers H. B. Harsch and Harry Harsch in charge of plant operations.


FOUNDRY SURVEY 19
SANDSLINGER INSTALLATION
CLEANING AND FINISHING ROOM STUDIES
AMERICAN STEEL FOUNDRIES
FOUNDRY SURV
FOUNDRY SURVEY
CR ARMOR STEEL TANK TURRETS
NEW FOUNDRY
FORD MOTOR CO. OF AUSTRALIA, PTY., LTD.
GEELONG, VICTORIA
GIFFELS & VALLET, INC.
L. ROSSETTI
SHELL MOLD FOUNDRY
LYNCHBURG FOUNDRY COMPANY
FOUNDRY SURVEY
SEALED POWER CORPORATION
FOUNDRY SURVEY
INGOT MOLD & MAINTENANCE FOUNDRY
GIFFELS & VALLET, INC.
L. ROSSETTI
NEW IRON FOUNDR
FIAT
SEE
WHAT They SAY
ABOUT
Giffels & Vallet
GIFFELS & VALLET, INC.
INDUSTRIAL ENGINEERING DIVISION
1000 Marquette Bldg. • Detroit 26, Michigan
FOUNDRY SU
GIFFELS & VALLET, INC.
L. ROSSETTI

abstracts

Abstracts below have been prepared by Research Information Service of The John Crerar Library, 86 East Randolph Street, Chicago 1, Ill. For photoduplication of any of the articles abstracted below, write to Photoduplication Service at the above address, identifying articles fully, and enclosing check for prepayment. Each article of ten pages or fraction thereof is $1.40, including postage. Articles over ten pages are an additional $1.40 for each ten pages. A substantial saving is offered by purchase of coupons in advance. For a brochure describing Crerar's library research service, write to Research Information Service.

Cheaper nodular iron

A265.."A New Procedure for Industrial Production of Nodular Cast Iron at Low Cost," Carlo Longaretti and Mario Noris, *La Fonderia Italiana*, Vol. 1, No. 1, June 1952, pp. 3-9. (In Italian)

Comparatively high costs of the usual procedures for obtaining nodular cast iron motivated the present work which resulted in a method using briquettes of porous pure magnesium immersed into the melt with the aid of a specially devised holder. Various kinds of nodular cast iron have been obtained in a series of preliminary experiments which hold the promise of notable reduction of production costs.

Furnace without refractories

A266.."Metals Melted Without Crucibles," E. K. Okress and D. N. Wroughton, *Iron Age*, Vol. 170, No. 5, July 31, 1952, pp. 83-86.

Induction levitation has been used as a means of melting metals and alloys such as titanium, zirconium, vanadium, and tantalum, which are contaminated on contact with all known refractory materials. By application of high-frequency current to suitably designed coils, the metal or alloy may be suspended in space and melted inductively at the same time. Alloying elements may be added while the metal is suspended. The alloy may be solidified by reducing the current or by directing a blast of cold gas onto it.

Cement-sand molding

A267.."Cement-Sand Molding," *Iron and Steel*, vol. 25, no. 11, October, 1952, pp. 441-446.

The Randupson process involves molding with sand bonded with Portland cement and water. This mixture is molded around patterns mounted in wooden boxes until it sets and then removed for air drying. Practices of the David Brown Foundries Co. with the process are described. The layout is diagrammed. There are three molding areas: loose-pattern, plate, and machine molding. Cement-sand reclamation is important and involves crushing, magnetic separation, screening and storage.

Advantages of such molding are influenced by the speed of operation. Coring, drying and mold assembly are described. A 10-ton Birlec arc furnace is used in steel-making and casting. Photographs are shown.

Iron in brass

A268.."Free Iron in Brass Ingot," *Metal Industry*, vol. 81, no. 19, November 7, 1952, p. 364.

Polishing of a brass ingot showed some imperfections due to presence of iron inclusions. Particles were tested magnetically. The free iron was thought to originate in the swarf, from which magnetic separation is not efficient when the swarf is oily. Ferrous particles are not readily soluble in copper-base melts but are suspended in them. Therefore, it was recommended that a low melting flux should be used. The wet cover produced is stirred and worked into the melt. The suspended inclusions are "wetted" and carried to the top of the melt where they are skimmed off with the slag. A photograph and photomicrograph are included.

Airframe castings

A269.."The Use of Castings in Airframe Design," A. H. Petersen, *Metal Progress*, vol. 62, no. 5, November, 1952.

Casting's place in aircraft design lies in intricate configuration where several units are combined and where cyclic loading is avoided. Acceptance tests for castings, airframe requirements and molding methods are discussed. Sand casting, diecasting, permanent casting and investment casting are compared. Examples of casting advances due to cooperation of aircraft engineers and foundrymen are given. Controls will be more rigid in casting as time goes on. Improvements in casting techniques will continue to refine structures, reduce porosity and microshrinkage and may eventually improve standardized alloy physical properties. Many tables and diagrams as well as photographs are shown.

Compare bentonites

A270.."Comparison of Some Bentonites and their Applications in the Foundry," A. Catelani and G. Somiglo, *La Fonderia Italiana*, No. 2, July 1952, pp. 36-38. (In Italian)

The authors discuss the properties of bentonites and their comparative merits in foundry applications. The behavior of bentonites under various heat conditions and the determination of the optimum quantity of water is related. The proportion of bentonite in synthetic sand must be established at a point where cohesion, resistance to impact, and permeability become most effective.

Scrap aluminum

A271.."Secondary Aluminum and No Apology." M. J. Davison, *Canadian Metals*, vol. 15, no. 11, October 1952, pp. 74-76.

The prevalent attitude toward secondary aluminum is discussed. Aluminum scrap can be used for wrought and cast alloys. Classification problems of alloy scrap are described. Secondary ingot producers have conducted studies on the characteristics of aluminum casting alloys as related to chemical composition and contaminating elements.

Specified compositions, as a result of the study, can be produced by blending of prepared scraps. Rigid metallurgical control is necessary. The spectrograph is useful in this regard; mechanical and physical properties are tested also.

T. R. Gupta, Jay Engineering Works Ltd., president of the Institute of Indian Foundrymen, introducing John F. Schnur, foundry consultant with the International Division of Armour Research Foundation, who spoke before the Institute at Jay Engineering Works. Seated, left to right, are: Arjan Vaswani, Institute secretary; N. G. Chakraborty, Bhartia Electric Steel Co. Ltd., Institute vice-president; Mr. Schnur; and Shri Ram, Jay Engineering Works.

Members of the new University of Wisconsin Student Chapter of A.F.S. at their installation January 15. In the center, Technical Director S. C. Massari presents cast iron rattle and a hot-off-the-press copy of the new *Pattern-maker's Manual* to Chapter Chairman J. H. Dance. At right is Prof. R. W. Heine, faculty advisor of the new Student Chapter.

chapternews

New Student Chapter

■ The 14th student chapter of A.F.S. was installed at the University of Wisconsin the evening of January 15. Concluding with the traditional handing of the cast iron rattle to the student chapter chairman, J. H. Dance, by Technical Director S. C. Massari, the installation program featured talks by Prof. G. J. Barker, National Director Martin A. Fladoes, and Mr. Massari. Prof. Barker outlined the work of the A.F.S. Educational Div., which he heads, and told the students they were making foundry history in forming the student chapter. He invited them to return to the University of Wisconsin in 5 years to show what progress they have made in their work.

Mr. Fladoes assured the students that they would enjoy a career in the foundry and could expect to play a role in the advances of the industry in the next three or four decades. Mr. Massari told how cast tank hulls were introduced in World War II to do a job which couldn't wait on welded hulls. This evidence of industry progress, he said, can be projected into the future to illustrate the growth and progress of the foundry industry students would soon enter.

The meeting opened with remarks by Dean M. O. Withey and Prof. E. R. Shorey, both of whom expressed pleasure at seeing the group formed. Others who spoke briefly or were introduced so the students could see how interested the industry is in them included George K. Dreher, Foundry Educational Foundation, Herbert F. Scobie, AMERICAN FOUNDRYMAN, and A. F. Pfeiffer, vice-chairman of the Wisconsin Chapter. Mr. Pfeiffer introduced the following Wisconsin Chapter members: Robert V. Osborne, Leonard Gratz, Harold A. Ziebell, J. A. Gitzen, John Olle, and R. J. Anderson.

In the afternoon preceding the installation, the Foundry Educational Foundation industry and university advisory committee met to review the FEF program at Wisconsin and to meet students participating in the Foundation program. In opening the FEF meeting, Dean Withey pointed out that the success of the program is due in no small part to continued industry interest.

Brooklyn Polytech

Members of the Metropolitan Chapter, plus several officials of A.F.S., gathered at the Essex House, Newark, New Jersey, on January 5 to honor the Faculty and Students of Brooklyn Polytechnic Institute and to witness the installation of a new A.F.S. Student Chapter there.

The installation was presided over

SRO was the order of things at the second annual Ladies' Night Dinner held last month by the Western New York Chapter at the Buffalo Athletic Club. Feast was enhanced by music and entertainment. (Photo by A. J. Heysel, E. J. Woodison Co., Buffalo, N. Y.)

. . . you can always FIGURE on finer castings with better bonded molds— using top quality **NATIONAL BENTONITE**

Consistently high quality National Bentonite has been figured on regularly for years by many expert foundrymen, who demand better molds—molds with high green strength, good hot strength, and minimum moisture content for finer-finish castings . . . fewer rejects. That's why so many good foundrymen say, "I can rely on National Bentonite."

FIRST CHOICE WITH MANY GOOD FOUNDRYMEN FOR YEARS

Quick Service From Better Foundry Suppliers Everywhere

Baroid

Baroid Sales Division ☆ National Lead Company

Bentonite Sales Office: Railway Exchange Building, Chicago 4, Illinois

Measure by Weight Instead of Volume...

Two important variables to the success of good foundry molding are frequently overlooked . . . proper mixing and proportioning of mold, facing and core sand.

Large amounts of sand and small percentages of other materials make up the sand mix. Some additions are as low as one percent, to add certain physical properties to mold or core sands. Slight changes in proportioning can change the mold characteristics entirely. That's why measuring is so important.

Measuring is done many ways . . . by shovels, gallons, quarts, cubic feet, wheelbarrow . . . or by weight. Needed volumes may vary considerably, depending on the moisture of the sands.

With sand put into the muller, it's time to add other ingredients for a skillfully worked out mix. So Mr. Mixer measures out quarts or gallons of bentonite in a nice clean gallon measure, bumping it between dips in the sack to get, at last, a nice heaping measure . . . perhaps a gallon and a quarter. Multiply this error five or six times and see what it does to proportions. Surprising, too, how many pounds a gallon of bentonite, or any dry binder, will weigh when measured by different operators.

To properly add dry binders, use a scale. It's surprising how closely mixes follow a set pattern when everything is weighed accurately. Time consumed weighing is far less than measuring too, and far less costly, counting failures turned into successes.

Fun, fellowship, food and plenty of refreshments—that was the order of festivities at the Metropolitan Chapter's gala Christmas party. Members gathered at the tables in individual foundry groups, then mixed it up later during elaborate program of entertainment.

by Student Chairman Emil Rogner, who introduced the members of the new student group as well as those participating in the ceremony. Arrangements for the installation meeting were made by Metropolitan Chapter Chairman James S. Vanick, International Nickel Co., N. Y., with the help of Acting Program Chairman Donald La Velle, American Smelting & Refining Co., Barber, N. Y.

Prof. E. L. Midgette, head of Mechanical and Metallurgical Engineering at Brooklyn Polytechnic Institute expressed the increasing interest of the school in training for foundry work. Prof. W. H. Ruten, Faculty Advisor for the Student Chapter urged foundrymen of the area to visit the school and to lend their support in improving facilities and courses of interest to metal castings producers.

A.F.S. President I. R. Wagner congratulated the students on their interest and discussed briefly the opportunities offered by the foundry industry to young graduate engineers. Others introduced included National Director E. C. Troy, Philadelphia, and Past Director F. G. Sefing, International Nickel Co., New York.

The official installation was performed by A.F.S. Secretary W. W. Maloney, who presented the famed cast iron Rattle, emblematic of all "Baby Chapters" to Student Chairman Rogner. A.F.S. pins were presented to each of the members of the new group.

A.F.S. Technical Director S. C. Massari, concluded the evening by presenting the Society's color, sound film, "Processes of Gating." Numerous questions from the floor were asked following the showing indicating extreme interest in the Horizontal Gating methods brought out by the film developed in a research project of the A.F.S. Line Metals Division.

Corn Belt

VERNON J. HOLMES
Paxton-Mitchell Co.

One of the latest additions to the A.F.S. family, the Corn Belt Chapter celebrated its first Christmas with buffet supper and dance. More than 75 couples attended the party. The Chapter received its charter last September.

At the Chapter's January meeting, members heard a shirt-sleeve discussion by William B. George, Lavin & Son Inc., Chicago, on *"General Brass Foundry Practice."* Mr. George described differences in various types of melting furnaces as well as gating and risering nonferrous castings. Risers are not effective, he said, if over six inches away from any shrink area, and full use of directional solidification must be made.

The board of five judges selected from the Texas Chapter was comprised of Jack Calhoun, Dee Brass Foundry, Houston; W. H. Lyne III, Hughes Tool Co., Houston; James R. Hewitt, Houston; George Clarkson III, Oil City Iron Works, Corsicana, Texas, and C. E. Silver, Chairman, Texas Electric Steel Casting Co., Houston. Three prizes of $25, $15 and $10 for 1st, 2nd and 3rd place, respectively were awarded to students William Moses, Carl Levesay and William Robinson.

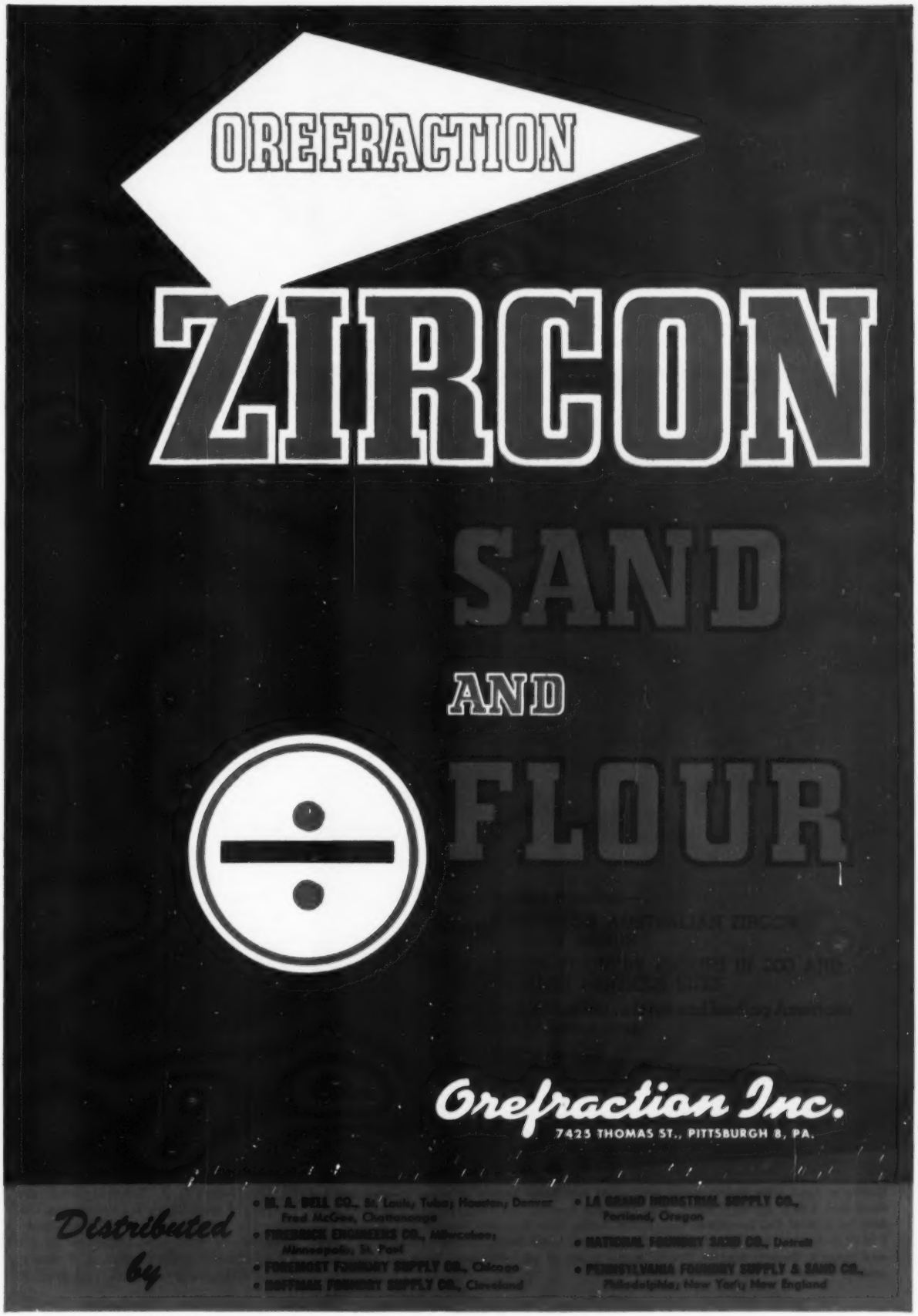
Rochester

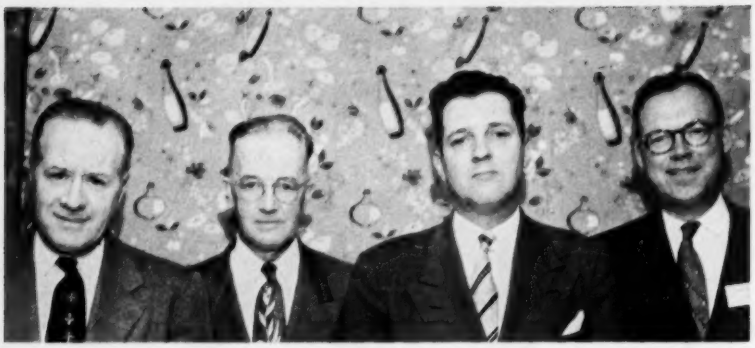
H. G. STELLWAGEN
Hetzler Foundries, Inc.

"Why porous castings? Why gassed castings?" were the introductory questions proposed by George P. Halliwell, H. Cramer & Co., Chicago, who then described methods of handling and casting non-ferrous metals in his speech at

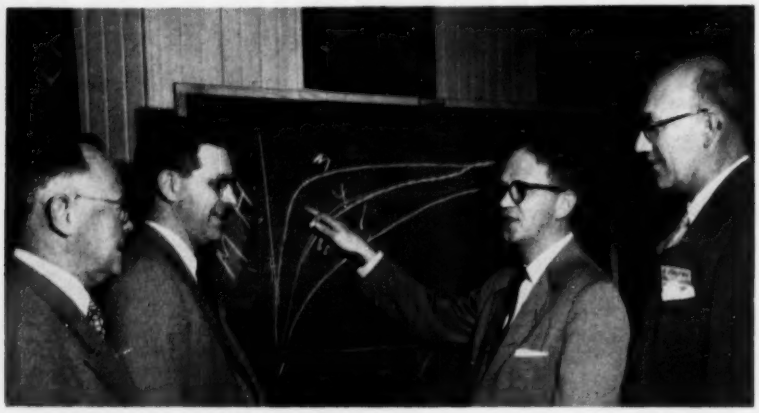
Prizes for lucky-number holders at the Tri-State Chapter's Christmas party included war bonds, elaborate electrical devices and flowers.

A few of the more than 75 couples who enjoyed the buffet supper and dance in celebration of the Corn Belt Chapter's first Christmas party.


OREFRACTION
ZIRCON
SAND
AND
FLOUR
Orefraction Inc.
7425 THOMAS ST., PITTSBURGH 8, PA.
Distributed by
• H. A. BELL CO., St. Louis, Tulsa, Houston, Denver
Fred McGee, Chattanooga
• FREDERICK ENGINEERS CO., Milwaukee;
Minneapolis, St. Paul
• FOREMOST FOUNDRY SUPPLY CO., Chicago
• HOFFMAN FOUNDRY SUPPLY CO., Cleveland
• LA GRAND INDUSTRIAL SUPPLY CO.,
Portland, Oregon
• NATIONAL FOUNDRY SAND CO., Detroit
• PENNSYLVANIA FOUNDRY SUPPLY & SAND CO.,
Philadelphia; New York; New England



In spotlight at recent Northern California Chapter meeting, were (L to R) W. S. Gibbons, Ridge Foundry, San Leandro, Calif.; G. W. Stewart, East Bay Brass Foundry, Richmond, Calif.; E. B. Rich and Davis Taylor, both of American Wheelabrator & Equipment Co., San Francisco.



Discussing influence of grain distribution on mold hardness of foundry sands at Central Illinois Chapter meeting are (L to R) A. D. Matheson, A.F.S. National Director, Kelsey Hayes Wheel Co., Davenport, Iowa; W. Bell, Franks Foundry, Rock Island, Ill.; J. S. Schumacher, Hill & Griffith Co., Cincinnati, and H. Felton, Caterpillar Tractor Co., Peoria, Ill.

Huddle at head table during recent meeting of East Texas Section of Texas Chapter included (back row, L to R) Malcolm Henly, Tyler Pipe and Foundry Co., Tyler, Texas.; Andrew Furlani, East Texas Steel Co.; Longview, Tex.; David McKie, Tyler Pipe and Foundry Co.; (bottom row, L to R) J. J. Chandler, Tyler Pipe and Foundry Co.; Israel Smith, Western Foundry Co.; Tyler, and James R. Hewett, Houston. Texas Chapter is one of 10 that already have met membership quotas.

the January meeting of The Rochester Chapter. "Adherence to rigid inspection, rigid specifications and x-ray of castings," Mr. Halliwell proposed, are the best means of obtaining a better product.

Tests have proved, it was pointed out, that by such practice tensile tests have been obtained on bronzes from 30,000 to 125,000 lb tensile, with Brinells of 250 and good ductility. Should foundrymen produce castings of good quality, there would be less substitution of other metals and of processes other than green sand casting.

Gas can be the cause of many bad castings, Mr. Halliwell said, and porosity caused by gas as well as that caused dirt, oxides and micro shrinkage occur when the melt is haphazard. Good furnace practice requires an experienced melter, not just any laborer that is handy. Pots must be kept clean. Unclean pots cause waste—oxides form and crucible growth adds to fuel cost in melting.

Expressing amazement concerning the practice in many foundries of melting aluminum in one pot and next to it brass or bronze—with the differing metals and alloys in piles next to each other on the floor of the melting area—Mr. Halliwell asserted that such foundries cannot expect to make good castings.

Central Michigan

LACHLAN CURRIE
Gale Manufacturing Co.

Central Michigan foundrymen currently are sponsoring a practical course in metallurgical fundamentals. The Chapter Educational Committee has secured qualified instructors to handle the various presentations. Sessions of the course are being held Tuesday and Thursday evenings (7 to 9), February 3 through March 12.

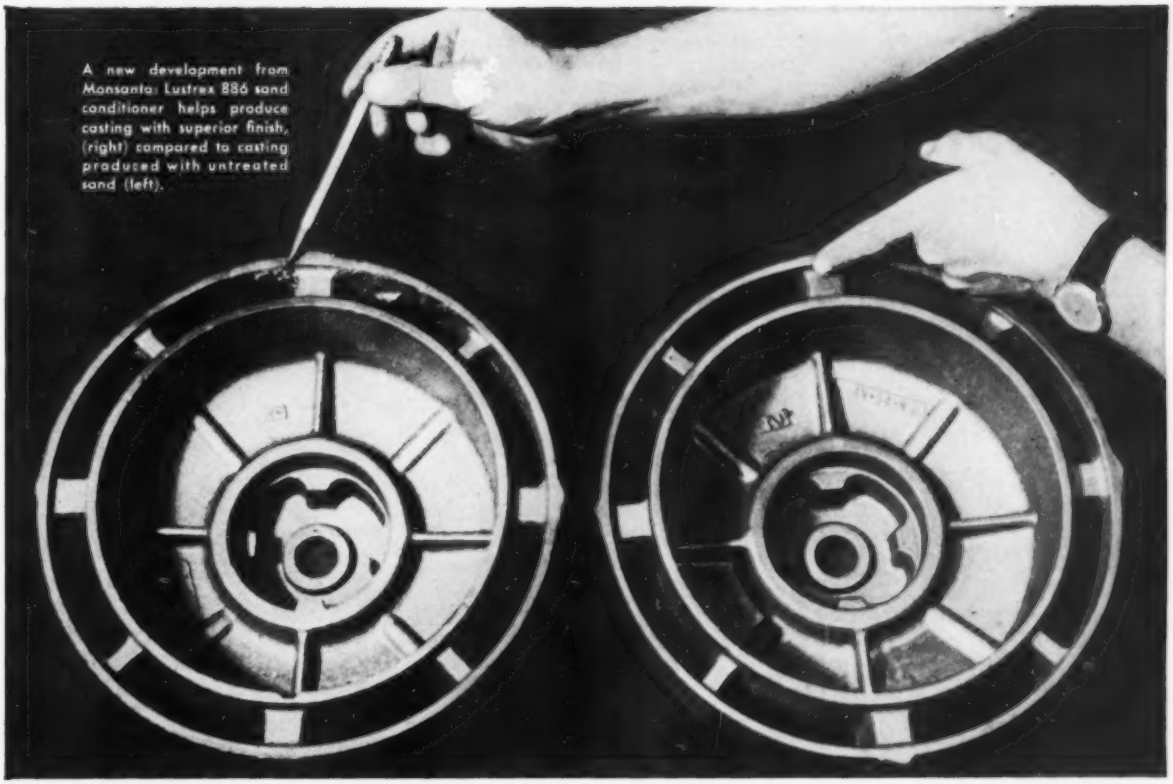
Inquiries concerning the remaining sessions should be addressed to F. B. Rote, Albion Malleable Iron Co., Albion, Mich.

Cost of the entire course, including textbook, was set at only $12.50 to members and $20 to non-members.

Remaining sessions, beginning with the February 17 meeting, will deal with applied fundamentals of metallurgical engineering. Richard A. Flinn, associate professor of metallurgical engineering at the University of Michigan, will discuss nucleation, grain growth, and influence of cooling rate in the solidification of metals, as well as such solidification defects as pipe, internal porosity, pinhole porosity, micro porosity, and surface checks or hot tears.

On February 24, N. M. Lazar, associate professor of chemical engineering, Wayne University, will deal with reactions of metal in the solid state—recrystallization, quench hardening, precipitation hardening, and tempering.

On March 5, R. Schneidewind, professor of metallurgical engineering, University of Michigan, will conduct a session covering graphitization of gray iron during solidification and cooling annealing malleable iron, and graphiti-



A new development from Monsanto: Lustrex 886 sand conditioner helps produce casting with superior finish, (right) compared to casting produced with untreated sand (left).

Another Monsanto development for the foundry

LUSTREX 886 SAND CONDITIONER

With Lustrex 886, you can now improve the quality of your castings *while* you trim production costs. In sand casting, new Lustrex 886 sand conditioner delivers these results:

- Castings have superior finish, requiring less clean-up
- Reduction of reject castings
- Simplifies sand moisture control (broadens workability range)

LUSTREX 886 SAND CONDITIONER

For full information on sand conditioning and how it can help you, send for Monsanto's new booklet, "Lustrex 886 – A New Sand Conditioner For The Foundry Industry." The coupon is for your convenience.

OTHER MONSANTO RESINS, RESEARCH-BUILT . . . FOUNDRY-TESTED . . . SHOP-PROVEN

Core Binders . . . For over 10 years, Monsanto research has been developing phenolic and urea resins for the foundry. From hundreds of formulations, several outstanding resins have been refined for the special needs of foundrymen.

Shell Molding . . . Monsanto continues to be a leader in the technique of shell molding, both as supplier of resins and in technical application work. You – like hundreds of other foundrymen – can look *first* to Monsanto for the latest developments, information and know-how on shell molding. Lustrex: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS — PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY, Plastics Division,
Room 5613, Springfield 2, Mass.

☐ Please send me your new booklet, "Lustrex 886 – A New Sand Conditioner For The Foundry Industry."

☐ Please send me your free new booklet on the shell molding process.

Name & Title _____

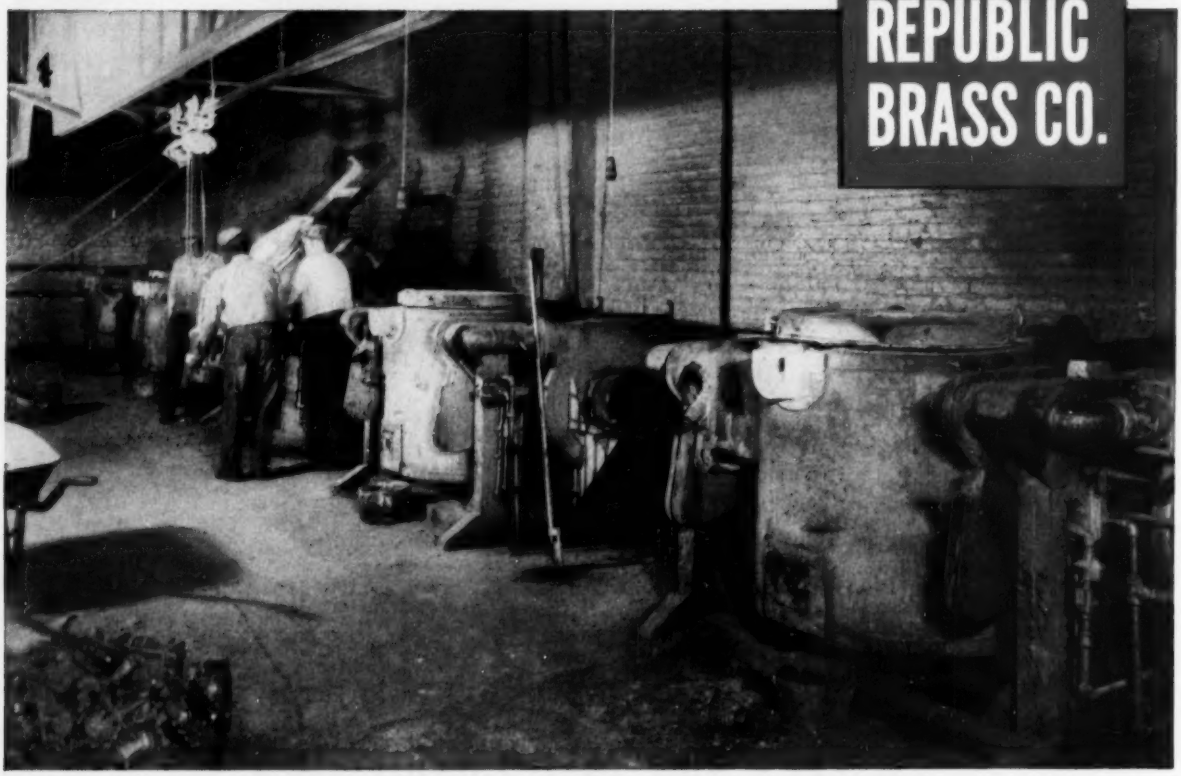
Company _____

Address _____

City, Zone, State _____

6 LINDBERG-Fishers for 6 years

and all's well at REPUBLIC BRASS CO.



LINDBERG-Fisher BRASS MELTING FURNACES STAND THE GAFF

All's well at The Republic Brass Co., (Division of Briggs Mfg. Co.), Cleveland, Ohio—manufacturer of water faucets and related plumbing fixtures. In 1945, as part of a modernization program, Republic installed six Lindberg-Fisher brass melting furnaces. These oil fired, constant arc, nose-pouring furnaces have more than withstood the test of time . . . and maintenance has been almost nil.

Here's what Mr. J. J. Smith, Republic's foundry superintendent thinks of his six Lindberg-Fisher brass melting furnaces:

"We have had six Lindberg-Fisher brass melting, nose-pouring, 1200 pound capacity furnaces for six years, and have had very good results from them . . . they deliver more than 100 heats per crucible . . . one hour twenty minutes per heat . . . 18 months lining life. They have performed very satisfactorily as to upkeep, and we have had excellent operating results."

Check these advantages of Lindberg-Fisher Hydraulic Nose-Pouring Melting Furnaces

- Constant pouring arc regardless of degree of furnace tilt.
- Rate of pouring always under positive and constant finger-tip control.
- Special trunnion mounting permits lower construction than hand tilting furnace.
- Reduced height facilitates charging cold metal, and observation of metal.
- Metal waste and pouring hazard greatly reduced by closeness of ladle to pouring spout.
- Labor saving . . . simple control enables one man to pour and transfer metal.

Write for Bulletin No. 57-A for more information on MNP-Motorized Tilting and HNP-Hydraulic Tilting Constant Arc Nose-Pouring Furnaces.

LINDBERG-Fisher MELTING FURNACES

Lindberg Engineering Company, 2463 West Hubbard Street, Chicago 12, Illinois

zation of ductile iron. And on March 10, Prof. A. J. Smith of Michigan State College, will lead another session in a study of melting practice and the origin, detection, and correction of typical defects in handling non-ferrous cast materials. Mr. Rote is in charge of arrangements for all meetings and will serve as one of the discussion leaders at the Review Session on March 12.

Chicago

E. J. WALSH
National Foundry Association

"Gating and Risering" are to be the subjects of intensive study during the coming month in special courses arranged by the Educational Committee of the Chicago Chapter under the chairmanship of Prof. Roy W. Schroeder, University of Illinois, Chicago. Three weekly sessions of two hours each have been scheduled for study of latest advances in gating and risering design in each of the four metals divisions—nonferrous, gray iron, steel, and malleable.

Dates of the sessions have been staggered so that all 12 may be attended by those who are interested in getting an over-all briefing on the subject. All groups will meet in Room 218, University of Illinois, Navy Pier, Chicago. Sessions of the Steel Division will convene from 6:30 to 9:00 p.m. The remaining three groups will meet from 7:00 to 9:30 p.m.

Meetings for the steel program are scheduled for three consecutive Mondays—March 16, 23, 30 Chairman A. P. Girolamo, Chicago Steel Foundry Co., Chicago, has announced that two sessions will comprise panel discussion on gating and risering of eight different problem castings—four per session. The other session will hear Robert Porter, Bronson Denehue Co., Chicago, discuss safety considerations and J. P. Caine, Wyoming, Ohio, (see page 51), present a paper on *"Basic Principles of Heading and Gating."*

Gray iron sessions will convene Tuesdays—March 17, 24, 31. Program for the first two meetings will feature such speakers as Harry Kessler, Sorbo Mat, St. Louis, and Howard Taylor of the Massachusetts Institute of Technology. The third session will present a brief safety study followed by a panel discussion on the problems presented in the course.

Non-ferrous meetings are slated for Thursdays, March 19, 26, and April 2. First session will comprise a study of *"Design, Layout, Gating and Risering of Pattern Equipment"* and a speech on *"Safety—It Must Be Sold."* On March 26, *"Causes and Corrections of Casting Defects"* will be discussed by Harry M. St. John, Crane Co. and Dean Leach, Howard Foundry Co., both of Chicago. Program for the final meeting will include the showing of a color film on the *"Effect of Gating Design on Casting Quality"* and an open forum on problems of non-ferrous gating and risering.

Meetings of the Malleable group will convene on Wednesdays—March 18, 25, and April 1. In first session, group will hear discussion on *"Theory of Gating and Risering Practice"* by Robert P. Schauss, Werner G. Smith, Inc., Chicago. Second session will feature B. C. Yearly, National Malleable & Steel Castings Co., Cicero, Ill., in a discussion of the *"Application of Gating and Risering Practice."* Final session will present C. C. Lawson, Wagner Malleable Iron Co., Decatur, Ill., in a discussion of *"Pattern Design for Good Gating Practice."*

For further information, write or call Prof. Roy W. Schroeder, University of Illinois, Navy Pier, Chicago, Ill.

Central Indiana

WILLIAM H. FAUST
Electric Steel Castings

H. N. Bogart, of Ford Motor Company, Detroit, led a general discussion of steel metallurgy and foundry practice at the January meeting of the Central Indiana Chapter. Fred E. Kurtz, Electric Steel Castings Co., was technical chairman of the program.

"With the advent of World War II," Mr. Bogart said, "changes and advances of specifications in metallurgy broadens

H_2O highballs for the new year was suggestion of President Leon C. Kimpal, Rochester Gas & Electric Co., at Rochester Chapter's let's-get-down-to-business January meeting.

Welcome to Central Indiana Chapter meeting is extended to Speaker H. N. Bogart, Ford Motor Co., Detroit (left) by Fred E. Kurtz, Electric Steel Castings Co., Speedway, Ind.

Caught in the act by Photographer Thomas Gallagher, Lake City Malleable Co., Cleveland, members of the Northeastern Ohio Chapter express approval of entertainment (above) provided for their annual Christmas party which attracted an SRO attendance.

V.I.P. Quintet at recent meeting of Philadelphia Chapter includes (left to right) G. H. Bradshaw, U. S. Naval Shipyard, Philadelphia; W. R. Ferrell, Delaval Steam Turbine Co., Trenton, N. J.; Guest Speaker T. F. Kiley, Mechanite Metal Corp., New Rochelle, N. Y.; and W. B. Coleman, W. B. Coleman & Co. and J. M. Robb, Jr., Hickman Williams Co., both of Philadelphia. Photo was snapped by Leo Houser, Dodge Steel Co., Philadelphia.

Benefits of the student membership in A.F.S. is explained to plant-visitation group during coffee-and-doughnut session following survey of Minneapolis Electric Steel Castings Co. operations. Plant tour was sponsored by Education Committee of Twin-City chapter.

Discussing plans for a recent Central Indiana Chapter Meeting are (left to right) Technical Chairman J. P. Lentz, International Harvester Co., Indianapolis, Chapter Chairman Carl O. Schopp, Link-Belt Co., Indianapolis, and William N. Davis, Director of the A.F.S. Safety Hygiene and Air Pollution Program, who spoke told group of S & H & AP work (see page 49).

the field of research particularly in trace metallurgy and in use of earth elements. We now hear of our alloys being extended by the addition of rare earths such as cerium and a mischmetal."

Mr. Bogart illustrated his discussion of foundry practice with some interesting slides of pictures taken in the Ford Foundry. His running commentary covered practically every activity in the foundry, from selection and segregation of scrap to be put in the electric furnace to the finished casting.

Specific problems encountered in the Ford Foundry were discussed and the methods used to overcome them. This evoked a detailed description of centrifugal casting and the advantage to which Ford has been able to employ this method.

Central Illinois

L. E. KINSINGER
Caterpillar Tractor Co.

Impetus was given to the March of Dimes drive at the January Meeting of the St. Louis District Chapter by a showing of the timely movie, "On our Own." The movie depicts the treatment of polio victims during rehabilitation.

Visiting A.F.S. National Director Alex Matheson, Kelsey Hayes Wheel Co., Davenport, Iowa, revised AFS membership gains throughout the nation, praising the Central Illinois Chapter for being one of the 10 chapters who already had exceeded the membership-drive quota.

J. S. Schumacher, Chief Engineer, Hill and Griffith Co., Cincinnati, spoke on "Fool Proof Sand," outlined the requirements as sand that results in low scrap, good finish, low cost, and a wide range of castings with one base.

Mr. Schumacher stated that mulled, four screen, molding sands (having 10 per cent volatile carbonaceous materials are 99 per cent fool proof. Citing examples convincingly explained how these relatively-sized sand grains ram together solidly and produce the desired requirements mentioned above.

St. Louis District

FRED J. BOENEKER
Bronze Alloys Co.

More than 400 members and their guests attended the St. Louis District Chapter's Christmas banquet. Dinner music was provided by a group of professional singers and the highlight of the entertainment, a complete vaudeville program, was staged by a well-known St. Louis producer.

Entertainment Chairman Clarence W. Culbertson, Great Lakes Carbon Corp., St. Louis, had arranged for many valuable prizes which were awarded to those holding tickets with winning numbers.

"Gray Iron Permanent Molding—The

Shell mold and bronze casting
by Walworth Co., New York 17, N. Y.

SHELL MOLDING

and Long-Run Production Schedules

When metal parts must be produced on long-run production schedules, foundries should consider the *shell molding* process. This improved foundry technique employs stable, lightweight shell molds made of fine-grained sands bonded with BAKELITE Phenolic Resins. Yielding castings that are almost pattern-smooth, the shell molding process can result in important time savings for both foundries and their customers. Here are some specific advantages:

For Foundries:

- Molds are light in weight, are easily handled and moved about.
- Molds can be stored until needed without deteriorating.
- Ninety to ninety-five per cent less sand is used.
- More good castings are yielded per ton of metal poured.
- Laborious surface finishing of castings is reduced.
- Complicated thin sections are cast with greater accuracy.

For Users of Castings:

- Castings have almost pattern-smooth surfaces, and fine detail.
- Pieces are cast to closer finished dimensions—tolerances as close as .003 to .005 inches per inch.
- Higher percentage of sound, uniform castings means fewer rejects.
- Reduced machining operations result in lowered production costs.

BAKELITE
TRADE-MARK
PHENOLIC RESINS FOR SHELL MOLDING

TRADE MARK

BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.
In Canada:
Bakelite Company (Canada) Ltd., Belleville, Ont.

Learn more about Shell Molding!
Send for this Free Booklet!

BAKELITE COMPANY, Dept. OR-39
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.
Please mail my free copy of the Booklet C-8, "BAKELITE Phenolic Resins for the Shell Molding Process."

*Name*_____ *Title*_____
*Company*_____
*Street*_____ *City*_____ *Zone*____ *State*_____

Santa's Helper R. N. Bryant distributes gifts for the ladies at Central Illinois Chapter's Christmas party. Seated at table (left to right) are L. G. Gunn, Mrs. Gunn and Mrs. Howard Jones.

"Feast of the East" is the term members of the Eastern New York Chapter use in describing the buffet supper served at their Christmas stag party. Entertainment of a "special" sort also was featured (see report on page 113). More than 200 attended the annual celebration.

Process and Its Application" was the subject of a speech presented by Howard U. McClelland, Eaton Mfg. Co., at the January meeting of the St. Louis District Chapter.

Mr. McClelland outlined the history of this comparatively new founding method and used a number of slides showing permanent mold methods employed at the Eaton foundry. The speaker described the problems encountered in developing a mold coating for iron molds which not only had refractory qualities, but which would adhere to integrate with the mold surface after repeated pourings.

The development of the mold and the machine to carry the mold through the casting cycle presented a number of mechanical problems where known design practices could be employed, Mr. McClelland said. The metal used in making the mold is of essentially the same composition as that used to pour gray iron castings.

Other metals, with and without alloys, have been tried, but Eaton has found that their present type gives the best mold life—lasting between 4,000 and 12,000 pourings. Castings produced range in weight from two to 20 lb each. The slides showed evidence of good housekeeping and a cost-saving materials handling system which was developed for Eaton's particular type of foundry operation.

J. H. Culling, Carondelet Foundry Co., served as technical chairman of the meeting, which was honored by the presence of H. G. Robertson, National Director of A.F.S.

Philadelphia

D. E. BEST
Bethlehem Steel Co.

Principal speaker at a recent meeting of the Philadelphia chapter was T. F. Kiley of the Meehanite Metal Corp., New Rochelle, N. Y. Among other things Mr. Kiley discussed the various hazards that can influence the quality of iron castings as a result of variations in the gating and risering.

His talk was illustrated with numerous slides showing variations in the gating and risering of simple molds, together with rules and tables from which correct sizes could be computed. The discussion dealt principally with small- to medium-size castings, with emphasis on the selection of proper locations for gates and risers.

It was pointed out that high strength irons have greater shrinkage which necessitates more or larger risers. It is a common error, Mr. Kiley asserted, to attempt to eliminate shrinkage type defects in low tensile expanding type irons by increasing riser size. These defects are more readily eliminated by chilling.

Saginaw Valley

ROY S. DAHMER
Eaton Manufacturing Co.

Horace Bringhurst, Assistant Director of the Coke Division, Defense Solid Fuels Administration, was the speaker at the January meeting of the Saginaw Valley Chapter at Frankenmuth, Mich.

In his discussion of "Cupola Fuels" Mr. Bringhurst described the method of manufacture of various materials used to melt iron, namely, by-product coke, beehive coke, anthracite coal, and coke breeze briquets. He pointed out that the process by which by-product coke is made permits close control of the end product.

Texas

C. E. SILVER
Texas Electric Steel Casting Co.

Members of the Texas Chapter traveled more than 100 miles recently to attend their annual combined meeting with the Student Chapter at Texas A & M College, College Station, Texas.

Program for the event consisted of

continued on page 112

Let Pangborn prove, at no cost to you, why you should

SWITCH TO MALLEABRASIVE®*

(SHOT AND GRIT)

for the LOWEST OVERALL CLEANING COSTS you've ever had!

THAT'S RIGHT! Pangborn is prepared to prove to you that Malleabrasive does a better cleaning job at lower overall cost than any other abrasive you've ever used! Here's a challenge you can't afford to pass up! Pangborn will test Malleabrasive *in your plant* for 30 days, without any cost to you. Your machines will be expertly adjusted by Pangborn engineers to get the greatest benefit from Malleabrasive. Your work schedule will go on uninterrupted, while this fair, scientific test is being run. At the end of 30 days, you'll have your proof!

We *know* we can convince you, because we've *already proved* Malleabrasive in foundries all over the country. What's more, since Pangborn *makes* blast cleaning machinery, we have tested *all* the abrasives, to determine the best. Malleabrasive won on all counts!

The *original* premium abrasive, Malleabrasive has approximately 50% longer life than other premium abrasives—2 to 4 times the life of ordinary abrasives. It reduces down-time and protects your investment because Malleabrasive makes machinery parts last longer. It turns out perfectly cleaned castings *every time*, and actually costs far less per ton of castings cleaned!

Don't just take our word for it! Let Pangborn engineers run this impartial test in *your* shop. For more information, write to: PANGBORN CORPORATION, 1300 Pangborn Blvd., Hagerstown, Maryland.

Malleabrasive Guarantees
Lower Cleaning Costs
and Better Cleaning Jobs
Than Any Other Abrasive!

Packed in orange striped 100-pound bags

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

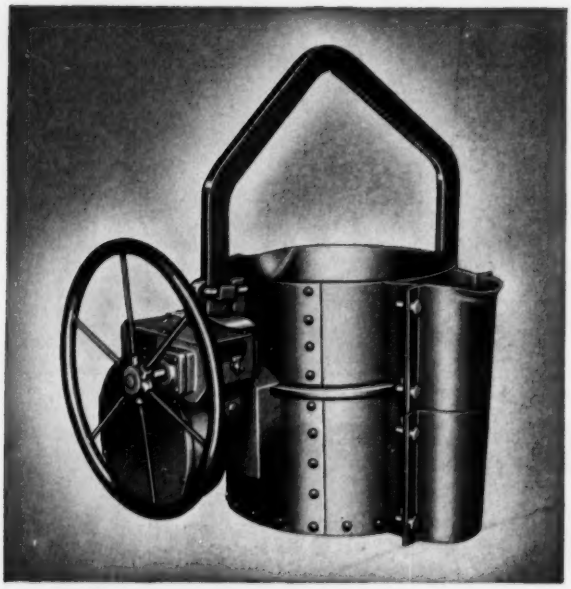
*U.S. Patent #2184926 (other patents pending)

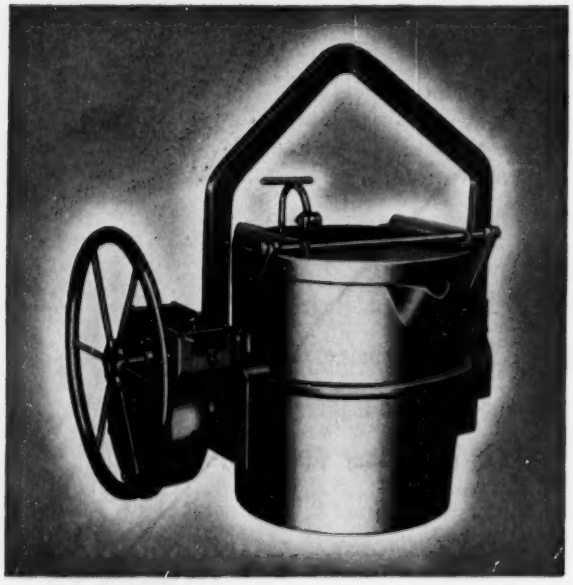
Pangborn

BLAST CLEANS CHEAPER
with the right equipment for every job

YOU'LL FIND THE TYPE LADLE YOU WANT AT

Ladle Headquarters





Industrial Equipment has all the ladles: teapot spout . . . covered . . . cylindrical . . . reservoir . . . buggy . . . bottom discharge . . . and many others, standard and special.

Each represents the last word in proven design and operating efficiency. All Industrial Crane Ladles are available with Industrial's revolutionary new universal bail which completely eliminates binding from heat or misalignment.

All geared ladles use Industrial's new hi-safety, self-locking worm gearing which uses no gaskets and which can be easily adjusted by anyone.

Write for Industrial's latest catalog. Illustrations, sizes, dimensions, technical features: all are included.

LADLES

SHANKS

BOWLS

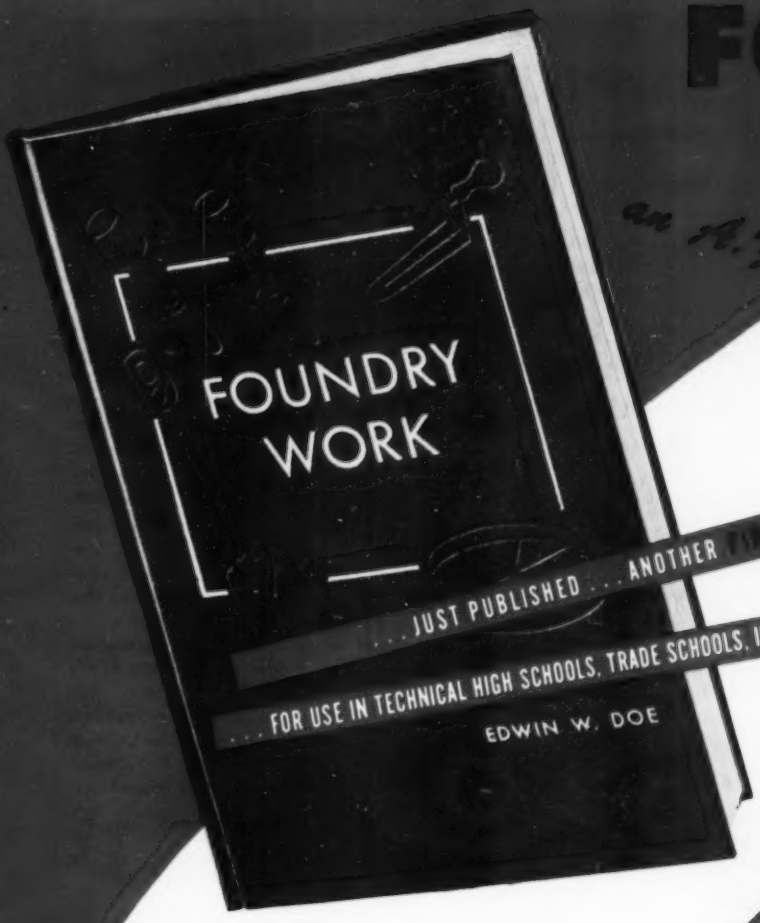
TONGS

Industrial
EQUIPMENT COMPANY
115 NORTH OHIO ST., MINSTER, OHIO

FOUNDRY WORK

an A.F.S. Endorsed

FOUNDRY TEXTBOOK



. . . JUST PUBLISHED . . . ANOTHER FIRST FOR A.F.S.

. . . FOR USE IN TECHNICAL HIGH SCHOOLS, TRADE SCHOOLS, INDOCTRINATION AND APPRENTICE TRAINING PROGRAMS

The first authentic high-school foundry textbook ever published. Prepared by Edwin W. Doe of Brooklyn Technical High School, Brooklyn, N. Y., under direction of the Educational Division of American Foundrymen's Society. *FOUNDRY WORK* is a compact, practical approach to foundry work and the foundry industry, including the tools, equipment, processes, patterns and other basic elements of the sand casting of metals.

The text is specially designed for rapid, progressive teaching of a fascinating, basic occupation that embodies both art and science. It tells why "Every product begins in the Foundry." It includes a series of simple molding problems for shop practice. An essential background text for an interesting, well-paying, *man's job.*

Contents . . .

1 THE FOUNDRY INDUSTRY—Early history. Modern foundries. Value of foundry products to modern industry.

2 FUNDAMENTAL FOUNDRY PROCESSES—Molding. Coremaking. Melting. Pouring. Cleaning and finishing castings.

3 FOUNDRY TOOLS AND EQUIPMENT—Hand tools. Mechanical tools. Flasks.

4 PATTERNS—Pivot-back patterns. Patterns with irregular parting. Split patterns. Gated patterns. Matchplate patterns.

5 SAND MOLDING—Green sand molding. Exercises. Floor molding. Exercises. Machine molding. Dry sand molding. Loam molding. Centrifugal casting.

6 BAKED SAND CORES—Hand coremaking. Exercises. Machine-made cores.

7 MELTING AND POURING METALS AND ALLOYS—Gray Iron: Cupola furnaces; Electric furnaces; Air furnaces. Steel: Open hearth furnaces; Converter; Electric furnaces. Nonferrous Metals: Crucible furnaces; Reverberatory furnace; Electric furnaces.

8 CLEANING AND FINISHING CASTINGS—Hand cleaning. Mechanical cleaning; Tumbling barrels; Sand blasting; Airless blast cleaning. Chemical cleaning. Auxiliary tools used in finishing. Inspection. Heat treatment of castings.

9 OCCUPATIONAL ADVANTAGES IN THE FOUNDRY—Glossary of Foundry Terms.

Case Bound Size 6 x 9, contains 109 pages, over 100 illustrations. Published by John Wiley & Sons Co., New York, for A.F.S. Price $1.76

AMERICAN FOUNDRYMEN'S SOCIETY
616 South Michigan Avenue
Chicago 5, Illinois

Please send me promptly _____ copies of "FOUNDRY WORK" by Edwin W. Doe.

I enclose $ _____ Cash ☐ Money Order ☐ Check ☐ to cover.
Please send invoice

Name _____

Company _____

Address _____

City _____ P. O. Zone _____ State _____

Postage paid by A.F.S. when remittance accompanies order

Advertisement

ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

COLUMBIUM and TANTALUM

Strategic Combination for Imparting Strength and Stability to High-Temperature Metals

Gas turbines for jet-aircraft engines, and for other similar engines being developed for marine and railway transportation, have greatly increased the demand for high-temperature metals. The present most satisfactory metals are either iron-base, nickel-base, or cobalt-base. They are used in the form of castings and hot-worked products, such as forgings, bars, and sheets.

Many of these special metals contain columbium because of its beneficial effect on high-temperature strength in both cast and wrought products. Investigations have shown that columbium is one of the key alloys for imparting high-temperature strength and stability in metals suitable for operating temperatures up to 1500 deg. F. and above.

Need for New Alloy

Originally, a ferrocolumbium alloy containing approximately 55 per cent columbium and 5 per cent tantalum was employed in the production of many of these high-temperature metals. However, with the increased use of high-temperature metals and columbium-bearing 18-8 stainless steels, the demand for columbium exceeded its availability.

ELECTROMET's Research Laboratories began investigations to ascertain whether an alloy containing more tantalum and less columbium would be equally satisfactory for producing the high-temperature metals. Columbium and tantalum alone, as well as combination alloys of columbium plus tantalum, were tested.

Results of Tests

The alloy N-155 was selected for tests. It is an iron-base alloy with the following approximate analysis:

Chromium	20 per cent
Nickel	20 per cent
Cobalt	20 per cent
Tungsten	3 per cent
Molybdenum	2 per cent
Columbium	1 per cent
Nitrogen	0.15 per cent
Carbon	max. 0.35 per cent

The data in the table below describe the mechanical properties, at room temperature, of this low-carbon N-155 alloy modified with columbium and tantalum alone, and with combinations of columbium plus tantalum. The metal modified with columbium has good strength and high ductility at room temperature. These same good properties are obtained when tantalum, or tantalum plus columbium, is substituted for the columbium.

Stress-to-rupture tests were also conducted on these same modified low-carbon N-155 alloys at 1350 and 1500 deg. F. The data show (see table) that when the columbium is replaced with a mixture of columbium plus tantalum, the strength of the metal remains substantially unaffected at 1350 and 1500 deg. F. Also, when all of the columbium is replaced with tantalum, the strength of the metal at 1500 deg. F. is equivalent to that obtained with columbium. Hence, from the standpoint of high-temperature strength, columbium and tantalum can be used interchangeably, or in combination.

Help to Industry

ELECTROMET has developed an alloy containing approximately 20 per cent tantalum and 40 per cent columbium for use in high-temperature metals and stainless steels. It is known as ELECTROMET ferrotantalum-columbium.

Industrial experience with this comparatively new alloy has confirmed the favorable results of the experimental work. The alloy has already aided considerably in augmenting the supply of columbium alloys, since it is just as effective as ELECTROMET ferrocolumbium, with 50 to 60 per cent columbium, for giving strength at high temperatures.

Furthermore, the new alloy is now preferred because of its greater availability. It should be added to a thoroughly deoxidized metal bath to obtain the best results. A recovery of about 90 per cent for the columbium and 80 per cent for the tantalum may be expected.

For further information regarding alloys for high-temperature metals, write to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Houston, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

Properties of Modified N-155 Alloys Compared*

Typical Analysis, %**	With Columbium	With Columbium and Tantalum		With Tantalum
Columbium	1.13	0.58	0.49	....
Tantalum	0.08	0.64	0.53	1.47
Carbon	0.12	0.13	0.13	0.12
Nitrogen	0.13	0.14	0.14	0.14
At Room Temperature				
Tensile Strength, psi	119,000	123,200	117,500	122,100
Yield Strength, psi	56,700	59,500	52,000	59,100
Elongation in 2 in., %	52	47	57	54
Reduction of Area, %	69	65	69	56
At 1350 deg. F.				
Stress to Cause Rupture, psi				
In 100 hr.	31,000	34,000	33,500	....
In 1000 hr.	23,000	25,000	23,000	....
At 1500 deg. F.				
Stress to Cause Rupture, psi				
In 100 hr.	20,000	20,000	20,500	20,000
In 1000 hr.	15,000	14,000	15,500	15,000

* Tests made on standard samples from one-inch round bars, water-quenched from 2250 deg. Fahrenheit.
** Composition of the base alloy is given in the text.

The term "Electromet" is a registered trademark of Union Carbide and Carbon Corporation.

Automatic Sand Preparation and Handling Increases Mold Output 35%

Sand Travels From Shakeout to Flask Without Shoveling—Using REDDY SANDY & HANDY SANDY

The Nelson Foundry Co., Morton Grove, Illinois, has increased their production 35% by using a combination of 3 Reddy Sandys and 3 Twin Hopper Handy Sandys. These units make sand conditioning and handling practically automatic thereby saving many manhours in the production of Brass and Aluminum Pressure-Tight castings. It is only necessary to dump the molds on the vibrating shakeout deck of the Reddy Sandy. The sand continues automatically through screening, magnetic separation, tempering and a double aeration until it is deposited in the hopper of the Handy Sandy for convenient use by the molder.

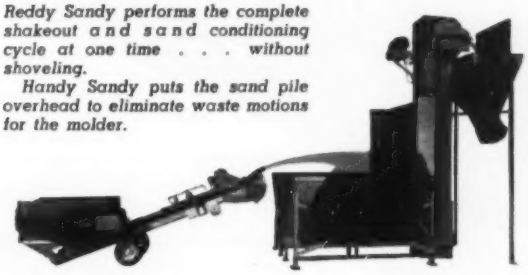
Mr. Wilbert K. Nelson, General Manager says: "To date we have encountered no hot sand problems as might be expected from these closely coupled units. The watering device has worked efficiently and sand is furnished to the molder in better condition than ever before.

"Our production has increased impressively especially on large molds, and in addition the molders and shakeout men are well pleased and less tired than formerly.

"To turn out the tonnage we are now able to produce would take twice the floor space with our former method of operation."

Reddy Sandy performs the complete shakeout and sand conditioning cycle at one time . . . without shoveling.

Handy Sandy puts the sand pile overhead to eliminate waste motions for the molder.

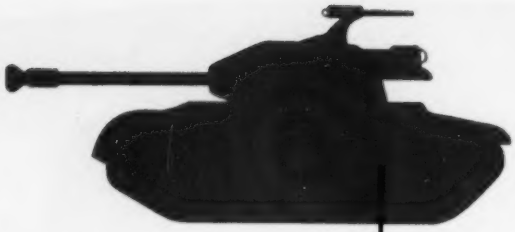


SEND FOR YOUR COPY OF THE NEW CATALOG: "PLANNED MECHANIZATION FOR FOUNDRIES." AIRMAIL YOUR REQUEST TODAY.

NEWAYGO ENGINEERING COMPANY

newaygo, michigan

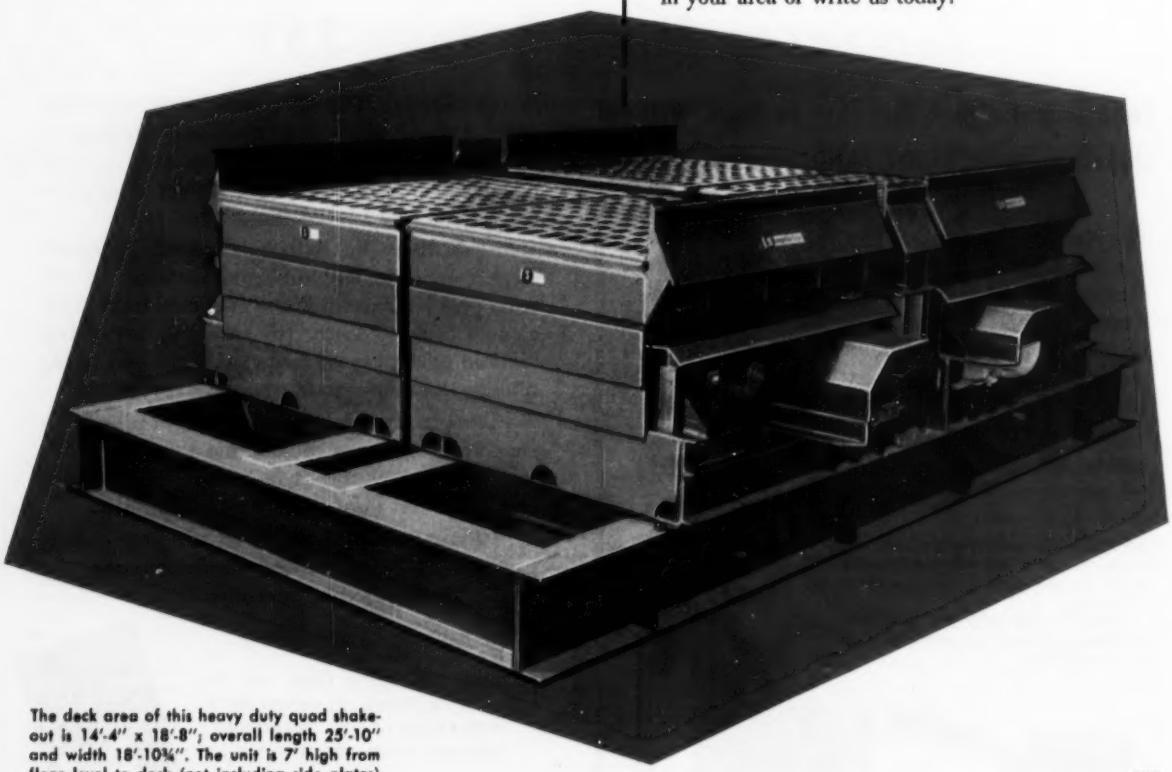
Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment



Talk about speed!

This powerful Simplicity spring-mounted unit shakes out 65-75 ton flasks in three minutes flat

A large well-known foundry, pouring huge tank hull castings, improved their shakeout operations by installing a Simplicity spring-mounted quad shakeout comprising four 7′ x 8′ steel-decked OM units. Operation is faster and quieter without annoying vibrations. *Positive controlled vertical vibration* eliminates travel of flask or casting. Simplicity Shakeouts do a thorough job in less time because the action is concentrated at the deck. The rigid supporting structure does not vibrate even with a light foundation. Simplicity Spring-mounted Shakeouts are available in all the large sizes for use as single units or in combinations. For complete information, consult the Simplicity sales representative in your area or write us today.



The deck area of this heavy duty quad shakeout is 14′-4″ x 18′-8″; overall length 25′-10″ and width 18′-10¾″. The unit is 7′ high from floor level to deck (not including side plates) and the total weight including motors and sub-frame is 75 tons!

125

Sales representatives in all parts of the U.S.A.

FOR CANADA: Canadian Bridge Engineering Company, Ltd., Walkerville, Ontario

FOR EXPORT: Brown and Sites, 50 Church Street, New York 7, N.Y.

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND, MICH.

products and processes

For additional information,

use postcard at bottom of page 103.

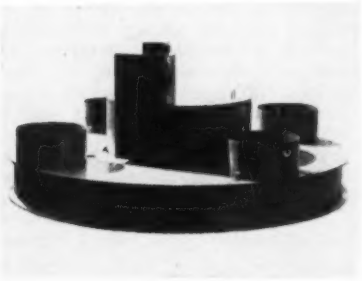
Furnace tilting device

Ball-bearing screw-and-nut assembly is said to surpass ordinary furnace tilting device. Wear on threads of nut-and-screw arrangement commonly used causes furnace to be released to rock back and forth, losing heat and splashing molten metal. New ball-bearing assembly promises 20 years of trouble-free operation. Can be used on new furnaces or as replacement on existing equipment. *Whiting Corp.*

For more data circle No. 4 on card, page 103

Centrifugal casting machine

Vertical, four-spindle, turntable-type, semi-automatic centrifugal casting machine makes ferrous as well as nonferrous castings in sand or permanent molds at low cost. Machine automatically indexes 90 degrees and stops. When a spindle approaches the pouring station it automatically comes up to spinning speed. Metal is poured and a button is pushed to initiate the indexing for the next 90 degrees. Poured mold continues to spin until metal has solidified. As solidified mold approaches removal station it is braked to a stop. Turntable is 10 ft. in diameter, has variable rotative speed of 1 to 3 rpm. Each spindle is driven by a 5 h.p., variable-speed motor with brake. *Centrifugal Casting Machine Co.*



Centrifugal machine has 10-ft (dia) turntable.

For more data circle No. 5 on card, page 103

Hardness tester

"Blosjo Porta," Brinell hardness tester, is designed for hardness range of 20 to 500 brinell, with maximum accuracy over full range of its 12 in. gap and 4½ in. throat. Instrument weighs only 19 lbs., will operate accurately in any position. New penetrator design requires only 500 KG of force. Impression is protected. Part to be tested is clamped between cylinder body and anvil, allowing penetrator to be forced into and retracted from the work leaving unmarred impression. *Blosjo Enterprises*

For more data circle No. 6 on card, page 103

Moisture measure by weight

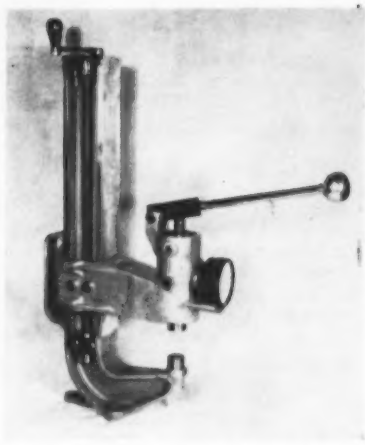
Cenco Moisture Balance (No. 26675) utilizes new principle of operation in drying samples of foundry sands by infrared radiation and weighing by a sensitive, null-point torsion balance. Scale of balance is calibrated directly in per cent moisture from 0 to 100 per cent in .2 per cent divisions. In operation (see photo) sample is placed in a light aluminum pan freely suspended on a pivot mounting. Lamp housing is lowered and oven turned on. As sample loses moisture, movable index is brought into line with the fixed index. Reading on the scale opposite the fixed index shows exact loss in moisture. *Central Scientific Co.*

For more data circle No. 7 on card, page 103

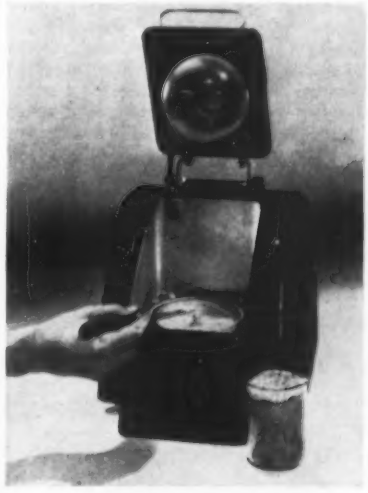
Core blower

Sutter Model SP-220 core blower (see photo) uses "tilt-fill" sand chamber that tilts backward on anti-friction bearings for refills. Refill is controlled by adjustable timer. Dome of the machine, over sand chamber, is a reservoir for compressed-air providing immediate release of air when blowing a core and

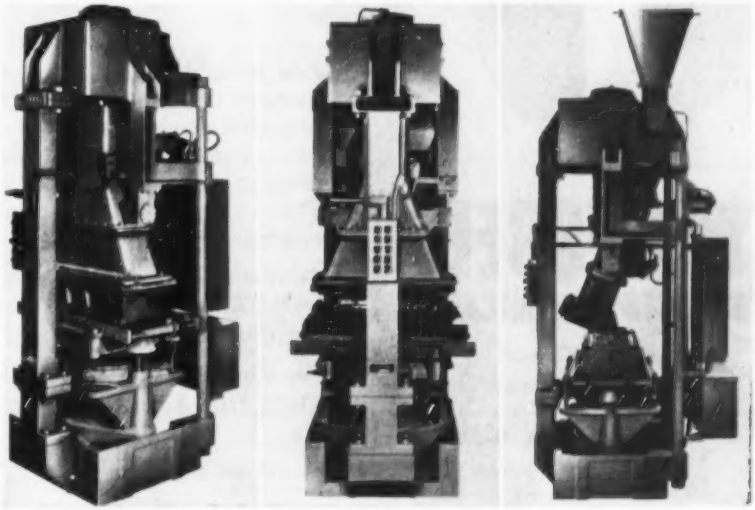
continued on page 103



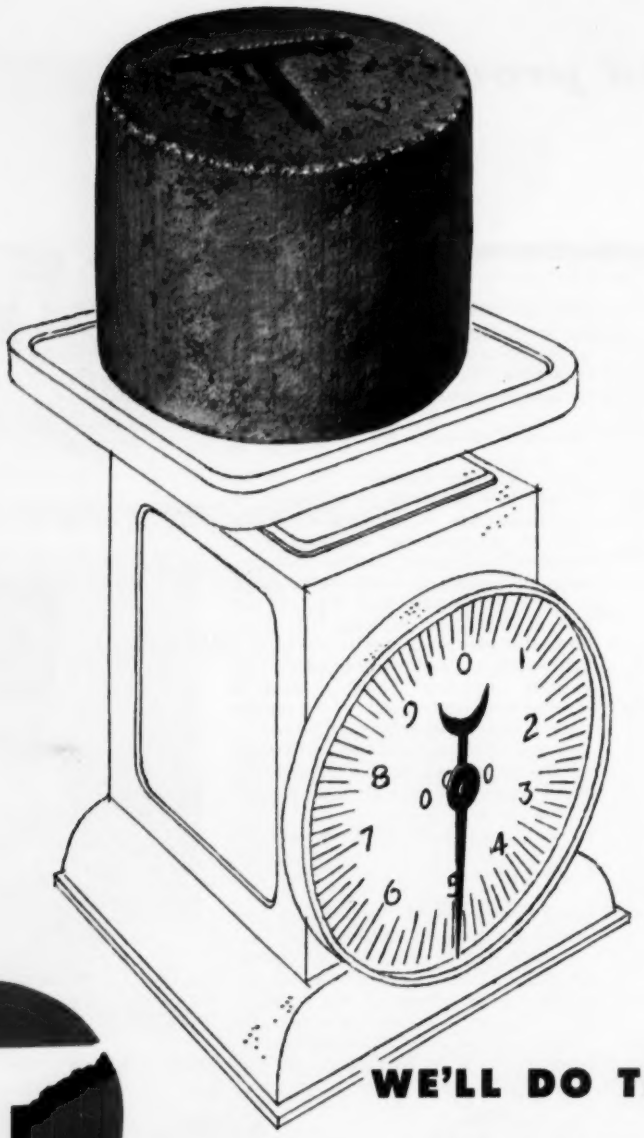
Hardness tester has 12 in. gap, 4½ in. throat.



Moisture balance utilizes infrared radiation.



Triple view of "tilt-fill" core blower shows (l. to r.) machine with draw table raised to sand chamber, with draw table lowered, and with sand chamber tilted for refill.



WE'LL DO THE WEIGHING!

The weighing in of your ferrosilicon and ferromanganese furnace charge takes place right in our plant when you use briquettes from Tennessee Products. These briquettes contain exact amounts of ferrosilicon and ferromanganese. All you have to do is count them out and throw them in the charge. They're easy to handle and store . . . speed up your foundry charging operations.

Ferrosilicon is available in lump, sized and powder forms as well. TENNESSEE also makes low phosphorous and malleable pig iron for special foundry requirements.

For complete details write to Tennessee Products & Chemical Corp., First American National Bank Building, Nashville, Tenn.

TENNESSEE
PRODUCTS & CHEMICAL
Corporation
NASHVILLE, TENNESSEE

products and processes

continued from page 101

compensating for fluctuations in line pressure. Blower operates on a ten-second cycle: 1) Raise core box to blow position, 2) Blow core, 3) Draw, 4) Removal of core box while sand chamber tilts and refills. Entire cycle is push-button controlled and can be manually or automatically operated. Machine has a core area of 12 in. x 34 in. with 15 in. maximum core depth and 10 in. draw. *Sutter Products Co.*

For more data circle No. 8 on card below

Black light inspection

Burton No. 1931 magnifier black-light unit provides fluorescent penetrant inspection of metals, ceramics, castings, parts, etc. It reduces operator fatigue and increases perception of defects. Flaws are viewed through precision-ground, triple-power glass. Twin tubes produce prolific but harmless 3660A ultra-violet energy directed upon the inspected surface. There is no back glare or heat. White fluorescent tubes may be used in the unit for high detail inspections. Unit weighs only 30 oz., measures 7 x 5 x 2 in. *Burton Mfg. Co.*

For more data circle No. 9 on card below

Liquid riser

Aluminum "Liquid Riser" is a clean, dry powdered material developed through research to provide efficient feeding compound for the heads and risers of aluminum and aluminum-alloy castings. Material is non-carbonaceous and free of silicon, iron, or other elements which might cause contamination. Applied on the risers after mold is poured, it enters into a slow, very intense exothermic action, reheating the feeding metal in the risers insuring that it will remain liquid while casting is feeding. Soft, dry ash remaining acts as an effective insulating blanket and further prolongs the time the riser remains liquid. *Exothermic Research Products, Inc.*

For more data circle No. 10 on card below

Self-cleaning return rolls

"Chevron Rod" return roll is designed to solve problem posed by wet, exceedingly fine or sticky materials which adhere to the return run of belts, causing damaging contact between the edges of belt and structural members of the conveyor, hangars, brackets, etc. Open design of "Chevron Rod" leaves almost no area on which materials can build up. Vibration or "slapping" action of the rods as they contact the belt helps keep belt clean. Design also exerts an aligning force on the belt. True alignment is thus easier to maintain and edge wear is largely eliminated. *Barber-Green Co.*

For more data circle No. 11 on card below

Improved hazard markers

Brady "Quick-Label" container markers stick fast to glass, metal, wood, plastic or ceramic containers without moistening—are silicone plastic-coated to resist oil, abrasion, and most hazardous materials the container may hold. Stock container markers are available in 36 different wordings including most hazardous materials in general usage. Special markers can be made to any specification. *W. H. Brady Co.*

For more data circle No. 12 on card below

Pulmonary ventilator

Oxygen distributing unit, with accessories, for application of bronchodilators and other agents for relief of silicosis and other fibrosis diseases. Readily operated by nurses, used by patients under physician's direction. *Mine Safety Appliances Co.*

For more data circle No. 13 on card below

Oxygen analyzer

Device provides accurate combustion control of flue or process gas by measuring magnetic susceptibility of oxygen without recourse to fuels, wicks, chemicals, filaments, or other aids. Accuracy within 1 per cent of full scale for spans of 5 per cent and greater is claimed. Can be used with any standard potentiometer recorder, controller, or pneumatic receiver. *Arnold O. Beckman, Inc.*

Reader Service Dept.

53|2

Please send me detailed information on the Products and Processes and Free Foundry Information circled.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

★ Please print or type information below

NAME

TITLE

COMPANY

ADDRESS

CITY AND ZONE

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 14680, Sec. 34.9 P. L. & R., CHICAGO, ILL.

Reader Service

AMERICAN FOUNDRYMAN

616 S. Michigan Avenue

Chicago 5, Illinois

free/foundry information

For additional information

use postcard at bottom of this page

Chill nails

Sample chart showing "Koolhead" chill nails and spider chills is available. Displays actual sample of nail with description of other sizes of additional styles and metals in which they may be obtained. *Standard Horse Nail Corp.*

For more data circle No. 14 on card below

Furnace-pump unit

Four-page folder describes characteristics and operation of combination induction holding furnace and pumping unit, for use in die casting of aluminum and zinc alloys. Contains photos of the unit in operation, the control cabinet, and installation diagram. *Ajax Engineering Company.*

For more data circle No. 15 on card below

Core baking equipment

Complete report is available on careful investigation of core baking equipment as used in an Eastern plant. Aim of study was to achieve greater economy and efficiency in operation. Report presents analyses of purchase price, installation costs, operating costs and other features in comparing dielectric-type core baking equipment with conventional tower or horizontal-type gas or oil fired ovens. A detailed study of an actual operation, this "economy report" throws considerable light on the advantages of electronic core baking. *Induction Heating Corp.*

For more data circle No. 16 on card below

Heat penetration of molds

Sixteen-page bulletin (Data 223C) deals with recent molding-sand experimentation and presents graphically the results obtained. Bond clays used in the experiments reported have widespread use in foundries. Some of the Heat Transference data is from published investigations made by members of the American Foundrymen's Society and the American Institute of Mining and Metallurgy. *American Colloid Co.*

For more data circle No. 17 on card below

Cupola blast control

Reprinted from American Foundryman, Bulletin FO-7 describes latest methods for maintaining quality and economy in cupola melting. Contains important data on air-blast control and humidity compression based on research by Battelle Memorial Institute; includes charts for determining relationship between humidity, blast rate and coke weight. *Whiting Corp.*

For more data circle No. 18 on card below

Testing machines

Eight-page folder illustrating current Amsler machines for test in tension, compression, torsion, shear, fatigue, bending and ductility. Separate bulletins available on wear testing and testing of miniature samples. *Buehler, Inc.*

For more data circle No. 19 on card below

Far-infrared panels

Specifications of the new Chromalox Electric far-infrared radiant panel are detailed in folder L1903(72-6). Every component part and characteristic of the panel is described as well as methods by which panels are assembled into complete ovens. *Edwin L. Wiegand Co.*

For more data circle No. 20 on card below

Aluminum melting

Complete line of Lindberg-Fisher gas and oil-fired aluminum melting furnaces is described in bulletin No. 310. Photographs of different types of aluminum, their uses and specifications are included. *Lindberg Engineering Co.*

For more data circle No. 21 on card below

Air filter data

A reprint (No. 270-P2) of the paper entitled "Operation, Application and effectiveness of Dust Collection Equipment" (originally presented at the Michigan State Industrial Ventilation Course) contains charts on costs of dust collect-

continued on page 117

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 14680, Sec. 34.9 P. L. & R., CHICAGO, ILL.

Reader Service

AMERICAN FOUNDRYMAN

616 S. Michigan Avenue

Chicago 5, Illinois

Reader Service Dept.

53|1

Please send me detailed information on the Products and Processes and Free Foundry Information circled.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

★ Please print or type information below

NAME

TITLE

COMPANY

ADDRESS

CITY AND ZONE

For positive carbon control use

MEXITE® Briquettes

in every cupola charge

Each briquette is the carbon equivalent of 50 lbs. of pig iron

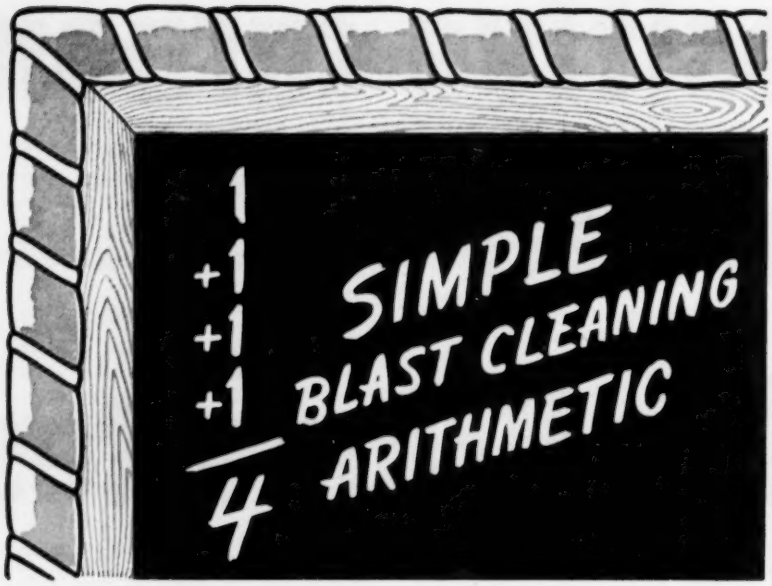
- **MEXITE prevents troublesome carbon variations throughout the heat by supplying a dependable source of soluble carbon . . . Use MEXITE for metallurgical carbon, use your coke for fuel.**
- **MEXITE is flexible . . . it can be used for carbon raising throughout the heat or at any time during the heat.**
- **MEXITE maintains the desired carbon analysis even when charging 100% scrap.**
- **MEXITE improves castings by reducing shrinkage defects due to low carbon.**
- **MEXITE means better fluidity, lower chill and hardness and easier machinability by insuring maintenance of the carbon analysis.**

Let our experienced foundry engineers give you all the facts about MEXITE . . . write us for detailed engineering bulletin.

173

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN



It takes four things to produce economy in blast cleaning operations: There is (1) the factor of the finish desired, all the way from a light peening operation to the removal of fused-in sand and scale. Then there is the matter of (2) speed—time is money—and a cleaning room can become an awkward bottleneck. Then there is the matter of (3) abrasive consumption, an important direct cost and finally there is the indirect, but expensive problem of (4) maintenance costs.

We have just this to say: Permabrasive annealed shot and grit are made in three controlled hardness ranges (each range held to a narrow range in hardness) permitting you to choose the grade best suited to secure the (1) finish desired with the (2) rate of cleaning called for by your production demands. Permabrasive shot is annealed practically a pellet at a time to produce unheard of uniformity and is made from Controlled "T" chilled iron shot, noted for (3) long life and (4) low maintenance costs.

You may be able to buy other brands of annealed iron abrasives for $10 to $20 less per ton, yet, we'll make you this guarantee: Your cleaning costs will be *LESS* with Permabrasive, regardless of the price you are now paying for annealed or steel abrasives. Care to make a test? On this basis you cannot lose—and we may surprise you—pleasantly. Write, wire or phone the Hickman, Williams office nearest you.

H W

REG. U.S. PAT. OFF.

P.S. A complimentary copy of "A Primer on the use of Shot and Grit" is yours for the asking.

PERMABRASIVE* SHOT AND GRIT *IS PRODUCED EXCLUSIVELY BY*
THE NATIONAL METAL ABRASIVE CO., CLEVELAND, OHIO
AND SOLD EXCLUSIVELY BY
HICKMAN, WILLIAMS & COMPANY
(INCORPORATED)
CHICAGO • DETROIT • CINCINNATI • ST. LOUIS • NEW YORK • CLEVELAND
PHILADELPHIA • PITTSBURGH • INDIANAPOLIS
*Licensed under U. S. Patent No. 2184926, U. S. Application No. 619602

letters

continued from page 22

tion. The modern Turk is probably the very best friend we have in Europe or Asia and has more American characteristics than any people I have met east of New York. He is a lover of freedom! He doesn't want to be shoved around! He is an earnest advocate of progress, and he is sometimes frightening in his determination to "find a better way." He has a tremendous admiration for "the American way."

There should be a law requiring every American to spend at least one month out of every five years in Turkey.

Our citizens would develop a new regard for Uncle Sam, would poll 100 per cent at every election, and would express a higher degree of elective intelligence!

SEES FELLOW FOUNDRYMAN

I met Max Ganzauge, General Railway Signal Co., Rochester, N. Y., in Istanbul. He has been over here as a consultant. I enjoyed his company and his advice and saw him off for America, as he saw me off for Ankara. I'd like to express to him my warmest regards and to say that I have no hesitancy in fully endorsing the suggestions and proposed plant revisions he so painstakingly placed on paper for the industry.

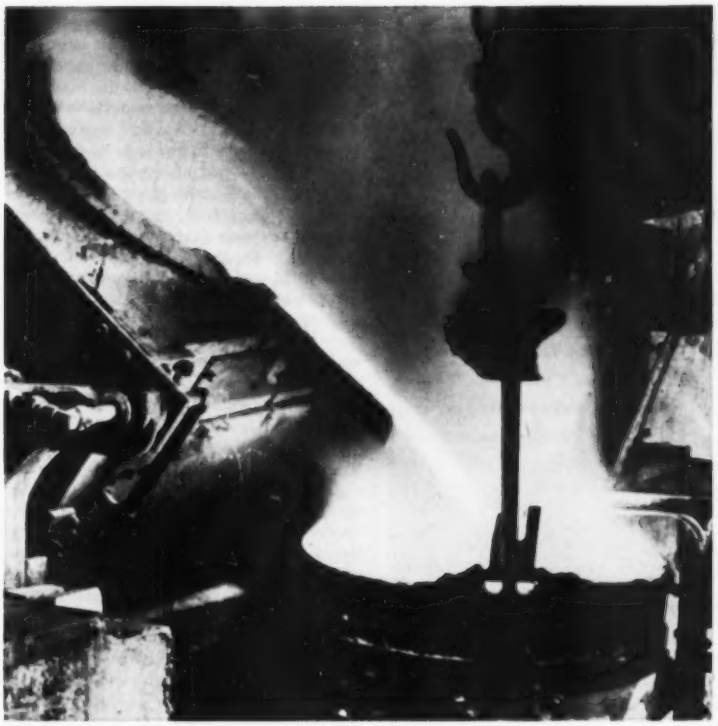
The sand now in use here is naturally bonded, shipped from Istanbul at 80 liras a ton (about $28) and an American molder wouldn't get to first base with it. These boys are artists. By all tests except permeability, the sand is terrible stuff. Most of the core sand is entirely ungraded (from dust to rocks) so they make their cores out of molding sand and water. I have been unable to find any worthwhile fireclay, no bentonite except one deposit 300 kilometers north of Ankara which has not been mined commercially, no core sand, no pitch compound, no core oil or corn flour, no muller of adequate size even if I had something to put into it.

AMPLE RAW MATERIAL

There's plenty of iron, coal, copper, chrome, and other materials here, and they have recently uncovered some bauxite. The ironical joke Allah has perpetrated on Turkey is that he has separated the iron and coal by a 1000 miles.

My job is clear—not sand control but sand discovery. I have been offered the use of a plane and pilot for the purpose of flying low over the terrain in search of sand and clay. I have practically everybody and his brother scratching for sand and some of the field men are reporting success from the mountains, deserts, and seashores.

Recently I was introduced to a visiting Congressman who greeted me with,



50 TONS of Stainless Steel a Day...

Melted in this AJAX-NORTHRUP INDUCTION FURNACE

Every 1¾ hours, one of these Ajax-Northrup furnaces pours 10,000 pounds of top-quality stainless steel. Total capacity is well over 50 tons a day!

Composition is uniformly exact. Alloying elements are controlled within a fraction of a per cent in every melt. Carbon is consistently kept below 0.05%.

Losses of expensive elements are negligible. Operating costs have been low enough to pay for the furnaces in just a few years!

This installation is typical of the growing use of induction melting for larger and larger jobs. In some of these, induction melting is the only way the job can be done. In others, it does the job better, faster, and at lower cost than any other melting method.

No matter what the job . . . or the quantity . . . Ajax-Northrup's 36 years of induction experience can help you. Just write or call us.

AJAX ELECTROTHERMIC CORPORATION
Ajax Park, Trenton 5, New Jersey

Associated Companies
AJAX ELECTROMETALLURGICAL CORP.
AJAX ELECTRIC FURNACE CORPORATION
AJAX ELECTRIC COMPANY, INC.
AJAX ENGINEERING CORPORATION

AJAX NORTHRUP
INDUCTION HEATING AND MELTING

Since 1916

148

these MARTIN products for core box protection

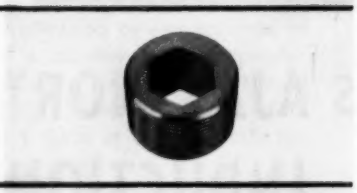
PETERSON VIBROLATOR quietly moves materials from bins and hoppers. Always instant starting. No maintenance, no lubrication. "Vibra-Tak" pocket-size vibration meter available. Check dead spots on vibrated match plates, bins, hoppers.

"SAND ARRESTER TUBE"

Save cores and step up production. Guaranteed for 100,000 blows.

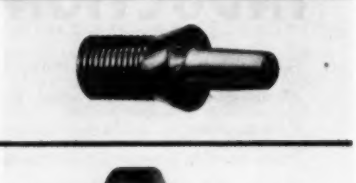
"HOLINER" BUSHINGS

Stop abrasion between blow plate and core box. Protect blow holes.



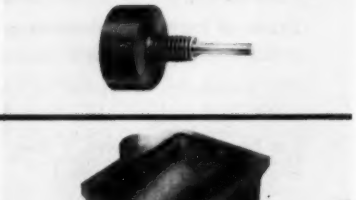
"PROTEXABOX" PINS

Cannot mar the box face because of protective rubber tip. Guaranteed to stay on.



"PULLINSERT" BLOW BUTTONS

Positively stop sand blasting under blow holes. Available in nine popular sizes.



"STRIPINSERT"

Protects parting line — easily installed in old or new boxes. Cutters for groove available at moderate cost.

NON-BINDING FLASK PINS

No production stoppages due to bending or binding of flask pins. Flexes and absorbs abuse, assures easy, perfect match.

See your distributor or write for literature to—

MARTIN ENGINEERING COMPANY

KEWANEE 3, ILLINOIS

"Oh, yes. You're the fellow who has everybody here looking for sand!" At our monthly MSA consultants meetings, there are agricultural experts who are attempting to improve and increase the wheat crop here. I manage to interrupt them with, "What about the corn? Our foundries need corn flour, and if they don't get it, what do you think will happen to your farm machinery?" I'm beginning to get these guys foundry conscious, and that won't hurt anybody.

In Istanbul alone there are 2600 foundries registered with the Government! This means that they pay taxes, and employ ten or more men. Nobody knows how many unregistered shops are doing business, shops that are family affairs—father and one or two sons —that can momentarily shut up and thus escape the tax gatherer. The unregistered shops are literally holes in the wall, about 8 x 10 ft, 8 ft high—three walls and a ceiling—the front entirely open. Small molds are placed and poured on the sidewalk, and castings are cleaned there, making people walk in the street at these points.

HAROLD E. HENDERSON

Reader keeps up to date

I have always been a very avid reader of AMERICAN FOUNDRYMAN and find it interesting and up to date. The "new look" you've had for the past year is an improvement on the magazine.

R. F. DALTON, *Dev. Eng.*
U. S. Gypsum Co.
Chicago

▶ *Indian foundrymen meet*

Recent technical meetings of the Institute of Indian Foundrymen included talks on *"Modern Development in Management"* by Prof. G. A. Robinson, and *"Oil-Fired Rotary Furnace and Economics"* and *"India Requires Malleable Iron Foundries"* by Prakash Gupta, Indian Malleable Castings Co. Ltd., Calcutta. Headquarters of the Institute are at P-33 Ganesh Chandra Ave., Calcutta 13, India. Visiting foundrymen may contact Secretary Arjan Vaswani at that address.

▶ *Centrifugal pipe casting film*

Two centrifugal casting processes are illustrated in the sound-color motion picture *"The Manufacture of Cast Iron Pressure Pipe"* recently released by the Cast Iron Pipe Research Association, 122 S. Michigan Ave., Chicago 3, Ill. Available without charge, the 16-mm film was made during the regular course of production and laboratory practice in three pipe plants. The film runs from raw materials to stacking pipe for shipment and shows all the steps of production in between. Animated diagrams show what goes on inside of the casting machines. The viewer is in effect taken on a personally conducted tour of the two centrifugal pipe-making processes, as well as the laboratory operations by which quality controls are maintained.

foundrymen

continued from page 30

of the Hudson County chapter, and is past president of Smoke Prevention Association of America. During World War II, he was Fuel Engineer for U. S. Bureau of Mines and a member of the National Fuel Efficiency Council.

C. Howard Paul, secretary-treasurer Mackintosh-Hamphill Co., Pittsburgh, has been elected a vice-president. He has been a member of the board of directors since 1944.

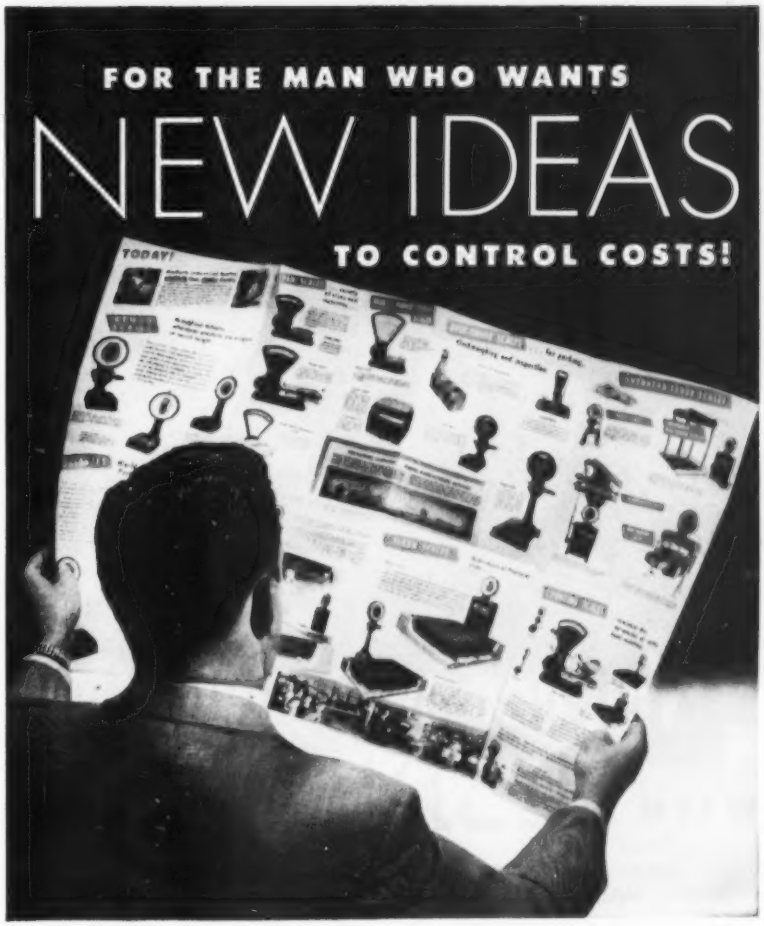
Mary T. Zemantowsky reports on recent attempts to relate sintering test results to other sand properties in her article *"Room and High Temperature Properties of Synthetically Bonded Molding Sand"* on page 57. Using washed silica sand bonded with western bentonite, she made a number of room and elevated temperature tests and concluded that her data did not show direct relationships between the "A" sintering point, the bentonite-water ratio, and the other properties studied. Miss Zemantowsky has been associated with the sand laboratory of the metallurgy division, National Bureau of Standards, Washington, D. C., since 1945.

Carl R. Loper, Allis-Chalmers Mfg. Co., and **J. D. Claffey** and **Frank L. Waldenmeyer,** Acme Aluminum Alloys, Inc., teamed up to tell the story (page 36) of how critical jet aircraft castings "with a pedigree" are produced. The pedigree is a check list of production and inspection steps which must be performed and recorded for each casting. Data on each of the many cores used are even recorded for each casting and production is implemented by a new design in dielectric core baking equipment which permits the use of metal core plates and dryers.

Leo Sekulski, Mathews Conveyor Co., Ellwood City, Pa., has been elected a director of the Conveyor Equipment Manufacturers Association.

William E. Buchan, president and treasurer of Appleton Wire Works, Inc., Appleton, Wis., has been elected to the Allis-Chalmers Manufacturing Co. board of directors. Mr. Buchanan fills the vacancy created recently by the resignation of **Edmund Fitzgerald,** president of Northwestern Mutual Life Insurance Co.

Robert H. Jacoby, metallurgist, Key Co., East St. Louis, Ill., has been beating the traffic problem for some 10 years by bicycling the 14 miles between home and work each day. With more than 100,000 miles of cycling rolled up, he makes the trip in 50 minutes and can do it in 43 if he's in a hurry. In bad weather, when he takes the car, the trip takes 70 minutes in the evening and an hour in the



...LOOK TO TOLEDO!

Whatever your problems in scales for receiving, charging, counting, or other foundry weighing operations . . . there's a modern Toledo to do the job with high *accuracy, speed* and *dependability.* Have you checked your scale needs? Get latest information in this widely used reference on Toledos that help you guard costs . . . speed production. Look into the advantages of Printweigh in stopping losses that originate through human errors. Send coupon for new edition—"Toledo, Headquarters for Scales."

SERVICE Factory-Trained 200 Cities

TOLEDO®
HEADQUARTERS FOR SCALES

SEND FOR THIS!

Toledo Scale Co., Toledo 1, Ohio

Please send without obligation your new edition on modern ways to weigh with Toledos.

Name_____

Company_____

Street_____

City_____ State_____

You can save money...

WITH ALSIMAG® CERAMICS

HEAT RESISTANT WORK HOLDING DEVICES

Precision made for your requirements. For holding work during brazing, soldering, electronic heating. Superior resistance to repeated hot-cold shock. Proper jigs, templates or other work holding devices can speed your operations many times over. Outline your problems and let us make recommendations.

PRECISION CORES

Can be furnished to exact dimensions for precision castings. Also economical and accurate method of forming many small area holes in castings.

STRAINER OR CUT-OFF CORES

Used in the riser to form a weak joint between riser and casting. Reduces cut-off time. In many cases riser can be knocked off instead of cut off. A great time and money saver. Can be made to your specifications. Cameron Cores, Patent No. 2313517, sold to Meehanite Licensees only.

GATE TUBES

Used in casting to convey molten metal into casting without contamination.

TROUGHS

For conveying molten metals. Custom made.

STRAINER CORES

These ceramic cores fit into gate of mold, strain the metal, regulate its flow. Cleaner castings, fewer rejects. Money saver. Made in two materials:

ALSIMAG 564 (WHITE) is less expensive, gives perfect performance with lower melting point metals such as cast iron. Adequate for some cast steel applications but test this material on steel applications before adopting it as standard. Has heat resistance above that of many materials recommended for use with cast steel but we are on the conservative side.

ALSIMAG 202 (TAN) has highest heat resistance. For use with higher melting point metals such as steel.

Dies in stock on many sizes and designs. Special designs reproduced economically. Samples from our files without charge. Special samples hand made at reasonable cost.

AMERICAN LAVA CORPORATION

CHATTANOOGA 5, TENNESSEE

50TH YEAR OF CERAMIC LEADERSHIP

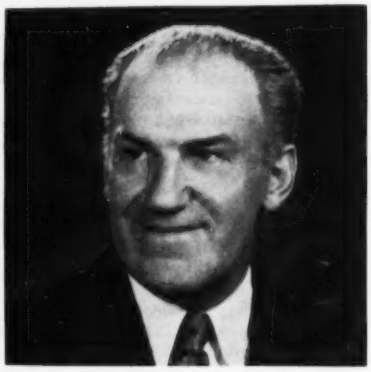
OFFICES: Philadelphia • St. Louis • Cambridge, Massachusetts • Chicago
Los Angeles • Newark, N. J. • Dallas, Texas

morning. Besides getting him to and from work faster, cycling keeps Mr. Jacoby in shape for running down trouble in the shop.

Dr. William Rostoker has been promoted to senior scientist, highest professional position at Armour Research Foundation. His new title is senior metallurgist.

Robert W. Mason has joined Engineering Castings, Inc., Marshall, Mich., as superintendent and plant metallurgist. Prior to this he was foundry manager of National Farm Machinery Co-operative, Inc., Bellevue, Ohio.

Hiram Brown, company chief metallurgist, Solar Aircraft Co., Des Moines, helped make education less painful Jan-



Charles C. Spencer . . . about furnace roofs.

uary 30 when, in lieu of a final examination in technical writing, graduating engineers heard him talk on *"Importance of Engineers Having Skill in Transmitting Ideas Orally and in Writing."*

Charles C. Spencer, melting superintendent, Electric Steel Castings Co., Indianapolis, reviews some 12 years' experience with an insulated electric furnace roof on page 65 and reports an increase to 400 heats from the previous average of 170 heats per roof. His article is one of the 1953 Convention papers and will be presented at a Refractories Session during the week of May 4 in Chicago.

William F. Roeser has received the meritorious service award of Sigma Tau, national honorary engineering fraternity. Mr. Roeser, consultant for the Building Technology Div. of the National Bureau of Standards since July 1950, has been chief of the Mechanical Metallurgy Sect. and assistant chief of the Metallurgy Div.

Leon Shaw, formerly with Shaw Foundry Co., Dallas, Texas, has been appointed vice-president of Refinery Castings Co., Inc. of Dallas.

Four key executives have been added to the Chicago plant of Taco West Corp. They are: **Charles T. Laechelt,** purchasing

agent, **Ardmore M. Willer,** assistant sales manager; **Edward O. Marquardt,** chief mechanical engineer, and **Charles B. Karch,** production manager. All were formerly employed by Wheelco Instruments Co., Rockford, Ill.

Metropolitan Brass Founders Association elected the following officers at the annual dinner meeting January 14: **Jack Friedman,** Bronx Brass Foundry Inc., Bronx, *president;* **Raymond Bistry,** B & S Bronze Foundry Inc., Brooklyn, *vice-president; and* **Dora Ostroff,** Thomas Paulson & Son Inc., Brooklyn, *secretary-treasurer.*

William A. Meissner, Jr., has been appointed deputy director of the Copper Div. He was recently chief of the Foundry Branch, Copper Div., NPA.

Jacob S. Coxey, Jr. president and chairman of the board of Industrial Silica Corp., Youngstown, Ohio, has retired as president. He will continue as chairman of the board. **P. Grant Foreman** will succeed Mr. Coxey as president. Mr. Foreman has been associated with the corporation since 1931. **Myron E. Ullman,** a member of the board of directors and legal counsel has been elected vice-president, and **W. Glenn Bell** has been appointed manager of the order department to succeed **Charles F. Eberhart** who is retiring.

The council of the Institute of Metals has awarded its Medal (platinum) for 1953 to **Professor Georg Masing,** Institute für Allgemeine Metallkunde, Universitat Göttingen, in recognition of his outstanding contributions in the field of metallography. The council awarded the Rosenhain Medal for 1953 to **Dr. Charles Eric Ransley,** Research Laboratories, British Aluminum Co., Ltd., Gerrards Cross, Britain, in recognition of his outstanding experimental and theoretical work on gas-metal equilibria.

John G. Steinebach has joined the foundry department of the Chemical Div., Borden Co., New York, as sales representative in Michigan for the company's foundry products, including core and shell bonding resins, core pastes and sprays. Mr. Steinebach has been associated with Aluminum Co. of America as a foundry engineer in Cleveland and Detroit.

John Clark Alberts has rejoined the sales staff of Osborn Manufacturing Co., Machine Div. Mr. Alberts, who has just returned from a tour of duty with the Air Force, will headquarter in Chicago. He will serve as a sales engineer for a territory including Northern Indiana, Northern Illinois, Iowa, Wisconsin and Minnesota.

W. G. Munro has been appointed sales representative in southern Ohio and Kentucky for National Engineering Co., Chicago. He has been associated with the company since 1939.

Quality is Work...
not just a Word

Quality is a man in overalls and canvas gloves sorting metal. Years of experience tell him what is red brass, copper, silicon bronze, bell metal, lead, tin; or ferrous metal to be thrown aside.

Quality is a metallurgist selecting and assembling metals to be melted and balanced to meet the precise chemical contents specified in dozens of alloys required by industry.

Quality is a chemist testing samples of a melt until precise specifications are attained and he says it is time to pour.

Quality is millions of dollars invested in laboratories, research, storage, raw materials and distribution depots, so that Federated customers can be assured of specification products, uniform, *every* time.

Quality is the big staff of Federated representatives whose job is to share and solve the problems of the one-man shops and the big foundries that are Federated's customers.

Quality is the effort to achieve perfection . . . and the resources to apply that effort from the depths of the mine to the shipping-case which brings non-ferrous products to your place of business from Federated . . . Headquarters for Non-ferrous Metals.

Federated Metals Division

AMERICAN SMELTING AND REFINING COMPANY

120 BROADWAY, NEW YORK 5, N. Y.

In Canada: Federated Metals Canada, Ltd., Toronto, Montreal

Federated first in the non-ferrous field AMD

Aluminum and Magnesium, Babbitts, Brasses and Bronzes, Anodes, Die Casting Metals, Lead and Lead Products, Solders, Type Metals

BIN STUCK LATELY?

"Don't, mister. A hammer is the old-fashioned way to do it. Use a CLEVELAND vibrator instead. It's quicker, cheaper and more efficient."
CLEVELAND
VIBRATOR

Literature on request.

THE CLEVELAND VIBRATOR COMPANY

2786 Clinton Ave. • Cleveland 13, Ohio

Chapternews

continued from page 94

papers prepared and presented by Student Chapter Members on the subject "The Modernization of Texas A & M Foundry". All papers were illustrated by drawings showing proposed new layouts and new equipments desired to give more comprehensive training to the students taking foundry courses.

Central Ohio

WILFRED H. WHITE
Jackson Iron & Steel Co.

"Today's Challenge in Human Relations" was the subject discussed at the January dinner meeting of the Central Ohio Chapter. Speaker of the evening was B. H. Taylor, B. F. Goodrich Co., Akron, Ohio.

Mr. Taylor gave numerous stories and examples to emphasize how and why people do or do not get along with neighbors, family, employees and employers. He asserted that everyone experiences certain basic psychological needs. Among the most essential of these are feelings of importance and of faith in oneself. Anything which accentuates these feelings in the individual is an asset to all concerned—if such needs are ignored then troubles develop.

Mr. Taylor pointed out that management has a great opportunity to meet this challenge. He also expressed the belief that solving our basic human relation problems is the key to solving problems of greater scope such as the problem of the present cold war.

MoKan

THOMAS F. SHADWICK
United States Steel Company

The dinner dance at which Mokan Chapter members celebrated the holiday season was attended by 318 members and guests who enjoyed a round of community singing while the turkey dinner was being served.

Each lady received a purse-size, pen-and-pencil set as a table prize. A number of electrical appliances and other valuable and useful prizes were presented to the holders of lucky-number dinner tickets in a drawing at the conclusion of dinner.

Twin-City

R. J MULLIGAN
Archer-Daniels-Midland Co.

Despite near-blizzard weather some 40 students and apprentices from the Twin-City area participated recently in a tour of the Minneapolis Electric Steel Castings Co., Minneapolis, Minn.

The trip was planned and arranged

THE Short Cut TO LOW Scrap Losses

When consideration is given to the number of casting defects directly traceable to faulty sand practice, it becomes apparent that proper sand control is the short cut to low scrap losses.

The Gordon-Campbell sand testing units offer the latest improvements for checking these critical properties of sand mixtures: clay content, permeability, bond strength, moisture, core hardness, and core strength. The tests are quick, and no calculations are required. They offer the simplest approach to sand control.

Write for full particulars on Gordon-Campbell sand control units. Savings in scrap losses will pay for the program.

RAMMER-COMPRESSION TESTER—This simple unit combines ramming of specimens for permeability tests and making bond strength tests. Strength values are read on large dial.

PERMTESTER Permeability values for molding and core sand mixtures are shown on dial in a few minutes.

All Gordon-Campbell sand testing units are designed to conform with the recommendations of the Committee on Foundry Sand Research of the American Foundrymen's Society.

FREE TO ANY FOUNDRY MAN

Write for this booklet. It explains foundry sand control and how to reduce scrap losses.

GORDON SERVICE

CLAUD S. GORDON CO.

Manufacturers & Distributors

Metallurgical Testing Machines • Industrial Furnaces & Ovens • Temperature Control Instruments • Thermocouples & Accessories

Dept. 18 • 3000 South Wallace St., Chicago 16, Ill.
Dept. 18 • 2035 Hamilton Ave., Cleveland 14, Ohio

by the Twin-City Chapter Educational Committee, under the direction of J. D. Johnson, Archer-Daniels-Midland Co., Kings Lane & The River, Anoka, Minn., in cooperation with R. C. Wood and C. W. Sundberg, representatives of The Host plant.

Guides for the tour were men with wide experience in the general operation of a foundry as well as being specialists in certain phases of foundry practice.

Coffee and doughnuts were served at an informal get-together following the

Eastern New York

ALLAN J. KIESLER
General Electric

The Chapter's Christmas party, was a stag affair—the fifth annual celebration of this sort. Approval of the party was unanimous. Food was described as "superb," the entertainment "stellar" and the door prizes "super-colossal."

Attendance (well over 200) was in sharp contrast to that of last year when a blizzard kept the number down to thirty-four. Those unable to attend last year made up for it by celebrating twice as hard—until two o'clock in the morning, as a matter of record.

The entertainment kept the group whistling and stomping for more. It was the whistling and stomping type of entertainment, as evidenced by such comments as, "well molded, eh?" "strip the cope" and the like.

▶ *Chapters on target*
New members listed

A total of 10 Chapters already had hit their membership targets for 1952-'53 by the end of '52. Only 400 new members were still needed to reach the 11,000 mark A.F.S. has set for itself during the fiscal year.

Chapters which had exceeded their quotas before the end of the year were Birmingham District, Canton District, Central Illinois, Corn Belt, Eastern Canada, Michiana, Northeastern Ohio, Ontario, Philadelphia, and Texas.

Since last reported (December issue of AMERICAN FOUNDRYMAN) the following Sustaining and Company Members have been added to A.F.S. ranks:

NEW SUSTAINING MEMBERS

Golden Foundry Co., Columbus, Ind., S. F. Swain, Asst. Secy. & Treas. (Central Indiana Chapter). Conversion from Company.

Kohler Co., Kohler, Wis., E. J. Biever (Wisconsin Chapter). Conversion from Company.

NEW COMPANY MEMBERS

Acra-Cast Foundries, Huntington Park, Calif., Donald E. Harper, Partner-Mgr. (Southern California Chapter).

M. B. Barker Co., Memphis, Tenn., M. B. Barker, Jr., Vice-Pres. (Mid-South Chapter).

Cordova Machine & Foundry Co., Inc., Memphis, Tenn., H. T. Hendricks (Mid-South Chapter).

Dixie Foundry Products Co., Memphis, Tenn., Charles W. Parker, Mgr. (Mid-South Chapter).

Eastern Foundry Supplies, Inc., Newark, N. J., Whitney C. Russell, (Metropolitan Chapter). Conversion from Personal.

Electrical Equipment & Foundry Co., Pine Bluff, Ark., J. M. Pittman, Owner, (Mid-South Chapter).

Electric Casting Co., Inc., Azusa, Calif., Woodruff Bunker, Pres. (Southern California Chapter).

Wm. C. Ellis & Sons Iron Works, Memphis, Tenn., Henry C. Ellis, III, Pres. (Mid-South Chapter).

Layne & Bowler, Inc., Memphis, Tenn., Charles D. Gray, Fdy. Supt. (Mid-South Chapter).

Memphis Pattern & Model Works, Memphis, Tenn., W. E. Pace, Owner, (Mid-South Chapter).

Midland Iron & Steel Corp., Moline, Ill., Henry J. Davis (Quad City Chapter).

Sorbo-Cast Corp., New Brunswich, N. J., Reginald B. De Varennes, Wks. Mgr. (Metropolitan Chapter).

Frederic B. Stevens of Canada, Ltd., Toronto, Ont., Canada, C. C. MacDonald, Br. Mgr. (Ontario Chapter). Conversion from Personal.

Universal Cast Iron Mfg. Co., South Gate, Calif., James Walker, Fdy. Supt. (Southern California Chapter).

Portable bank of six lightweight Chromalox 2½-KW electric radiant heaters is easily moved from mold to mold; provides uniform, wide-band infrared heat with an even degree of penetration that eliminates moisture pockets, yet does not burn high spots. Handles on each end of bank make handling easy.

Foundry Gets Extra Mold Daily for 2000-Lb. Casting

Milwaukee, Wisconsin—A local foundry has added an extra unit to its daily production of large sand molds, without adding manpower, by changing to Chromalox Electric Radiant Heat for skin drying. As molds are used for 2000 to 3000-pound castings, production boost represents a substantial increase. Other advantages achieved with new drying method are: uniform drying of mold surfaces; quick warm-up; heat confined to work; and no toxic gases.

Drying was previously handled manually with an open kerosene torch, a hot, disagreeable task requiring full-time services of one man, and subject to human error. Occasional burning of some mold spots and incomplete drying of others often caused scrapping.

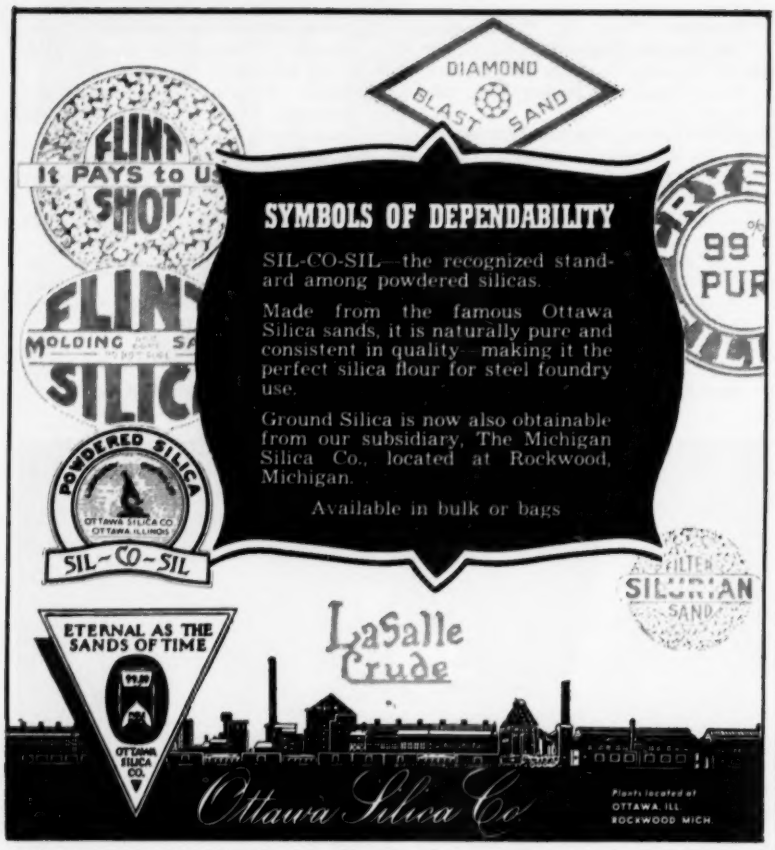
Two new drying units each consist of six 2½-kw, all-metal, Chromalox Electric Radiant Heaters with handles on each end of heater bank for easy portability. Heaters radiate long wave length, unfiltered infrared heat that is absorbed uniformly. Heaters can be switched on and off in groups of three. Rugged and compact, heater banks have now been in use for many months without damage.

Success of this Chromalox Electric Radiant Heater installation has, according to the plant's assistant superintendent, led this company to plan on four more similar setups.

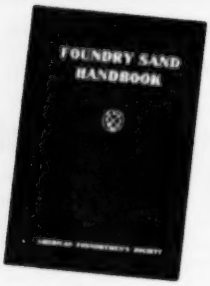
WRITE FOR MORE INFORMATION

EDWIN L. WIEGAND CO., Industrial Div. 88-25
7609 Thomas Boulevard, Pittsburgh 8, Pa.
I need infrared heat for _____
_____
Send me application file on above.
Name _____
Company _____
Street _____
City _____ State _____

CHROMALOX
THE BEST IN ELECTRIC HEAT


DIAMOND
BLAST SAND
SYMBOLS OF DEPENDABILITY
SIL-CO-SIL—the recognized standard among powdered silicas.
Made from the famous Ottawa Silica sands, it is naturally pure and consistent in quality—making it the perfect silica flour for steel foundry use.
Ground Silica is now also obtainable from our subsidiary, The Michigan Silica Co., located at Rockwood, Michigan.
Available in bulk or bags
POWDERED SILICA
SIL-CO-SIL
FILTER SILURIAN SAND
ETERNAL AS THE SANDS OF TIME
LaSalle Crude
Ottawa Silica Co
Plants located at OTTAWA, ILL. ROCKWOOD MICH.

FOUNDRY SAND HANDBOOK **LOOK!**



1 Completely rewritten by prominent foundry sand specialists
2 Twice as much information as contained in 5th edition
3 Includes a glossary
4 Includes a bibliography
5 259 pages . . . 93 illustrations

Prices AFS Members.....$3.50
Non-Members.....$5.25

***Sand Control is of Vital Importance* TO YOU!**

CHAPTERS COVER: Mode of Occurrence of Sands and Clays . . . Methods for Sampling Foundry Sands and Clays . . . Preparing Foundry Sand Mixtures for Testing . . . Methods for Determining Fineness of Foundry Sands—Standard . . . Determining Moisture in Foundry Sand Mixtures—Standard . . . Determination of Permeability of Foundry Sands . . . Strength of Foundry Sand Mixtures . . . Method for Determination of Green Surface Hardness—Standard . . . Determining the Sintering Point of Sand Mixtures . . . Elevated Temperature Tests on Foundry Sand Mixtures . . . Chemical Analysis of Sand—Non Standard Tests . . . Tentative Method of Testing Core Binders (Tensile Strength) . . . Mechanical Properties of Core Sand Mixtures . . . Method for Determining Strength of Core Paste—Tentative Standard . . . Non-Standard Tests . . . Interpretation of Room Temperature Sand Tests . . . Comments on Maintenance of Testing Equipment . . . Foundry Molding Sand Mixtures . . . Conversion Tables . . . Terms Used in Foundry Sand Work . . . Bibliography on Sand Testing and Control . . . Subject Index.

REMEMBER . . . no one can *consistently* produce quality castings in molds prepared from uncontrolled sand mixtures!

AMERICAN FOUNDRYMEN'S SOCIETY
616 South Michigan Avenue, Chicago 5, Illinois

coming events

February

16. . Quad City
Hotel Ft. Armstrong, Rock Island, Ill. W. W. Levi, Lynchburg Foundry Co., Radford, Va.

17. . Eastern New York
Circle Inn, Latham, N. Y. George K. Dreher, Foundry Education Foundation.

18. . Central Michigan
Hart Hotel, Battle Creek, Mich. J. E. Rehder, Canada Iron Foundries, Ltd., Bowmanville, Ont., Canada. *"Graphitization of Gray Iron, Malleable & Nodular Iron."*

19. . Penn State Student Chapter
Foundry Classroom. Penn State College, State College, Pa. E. C. Troy, E. C. Troy Co., Riverton, N. J. *"Foundry Equipment."*

19-20. . Southeastern Regional Conference
Tutwiler Hotel, Birmingham, Ala. Sponsored by Birmingham District & Tennessee Chapters and University of Alabama Student Chapter.

19. . Washington
Rose's Chicken Inn, Seattle, Tacoma Highway. L. W. Eastwood, Kaiser Aluminum & Chemical Corp. *"Non-Ferrous Foundry Practice."*

20. . British Columbia
Vancouver Vocational Institute. L. W. Eastwood, Kaiser Aluminum & Chemical Corp. *"Aluminum."*

20. . Texas
Beaumont, Texas. William Ball, Jr., R. Lavin & Sons, Inc., Chicago. *"Effective Essentials Required to Make Good Castings."* (Non-ferrous)

23. . Northwestern Pennsylvania
Moose Club, Erie, Pa. R. A. Colton, American Smelting & Refining Co., Barber, N. J. *"Making Better Castings."*

27. . Chesapeake
Engineers Club, Baltimore, Md. Donald LaVelle Federated Metals Div., American Smelting & Refining Co., Barber, N. J. *"Aluminum Test Bars—Their Meaning & Production."*

27. . Ontario
Toronto, Ont. S. C. Massari, A.F.S. Technical Director. *"Effect of Gating Design on Casting Quality."*

27. . Tennessee
Hotel Patten, Chattanooga. Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Co., Chicago. *"Sand Casting Defects & Relation to Sand."*

March

2. . Central Illinois
American Legion Hall, Peoria, Ill. E. J. Jory, Lester B. Knight & Assoc., Chicago. *"Core Practice as Related to Foundry Losses."*

2. . Metropolitan
Essex House, Newark, N. J. Panel Meeting: The Reclamation of Ferrous and Non-Ferrous Castings." Wilson N. Pratt, American Metaseal Corp. *"Impregnation."* A. Kugler, Air Reduction Corp., *Welding."*

coming events

Howard Vanderpool, Metallizing Engineering Co., *"Metallizing."*

2. . Chicago
Del Prado Hotel, Chicago. Management night. Earl Shaner, editor, *Steel.*

2. . Central Indiana
Athenaeum, Indianapolis. Richard Herold, Borden Co., New York. *"Shell Molding-Resin Binders."*

2. . Western Michigan
Bill Stern's Steak House, Muskegon, Mich. William Romanoff, H. Kramer & Co., Chicago. *"Brass & Bronze Foundry Practice."*

3. . Rochester
Seneca Hotel, Rochester, N. Y. J. H. King, Archer-Daniels-Midland Co., Toronto, Ont., Canada. *"Cores."*

4. . Toledo
Toledo Yacht Club, Toledo.

5. . Canton District
Alliance Elks Club, Alliance, Ohio. Lawrence D. Pridmore, International Molding Machine Co. *"Core and Mold Blowing."*

6. . Mid-South
Hotel Chisca, Memphis, Tenn. C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago. Commentary and film *"Materials Handling."*

6. . Corn Belt
Rome Hotel, Omaha, Nebr. W. A. Hambley, Kraus Milling Co., Birmingham, Mich. *"Casting Defects."*

6. . Western New York
Hotel Sheraton, Buffalo, N. Y. Round Table: Gray Iron—H. Wilder, Iron Foundry Div. Vanadium Corp. of America, Detroit. Non-Ferrous—William Ball, Jr., R. Lavin & Son, Chicago. Steel—Martin J. O'Brien, Jr., Vulcan Iron Works, Wilkes-Barre, Pa.

6. . Eastern Canada
Mount Royal Hotel, Montreal. Franz Schumacher, Cooper Alloy Foundry Co., Hillside, N. J. *"Modern Developments in Pattern Making."*

9. . Twin City
Covered Wagon, Minneapolis. Albert F. Pfeiffer, Allis Chalmers Mfg. Co., Milwaukee. *"The Patternmaker's Art."*

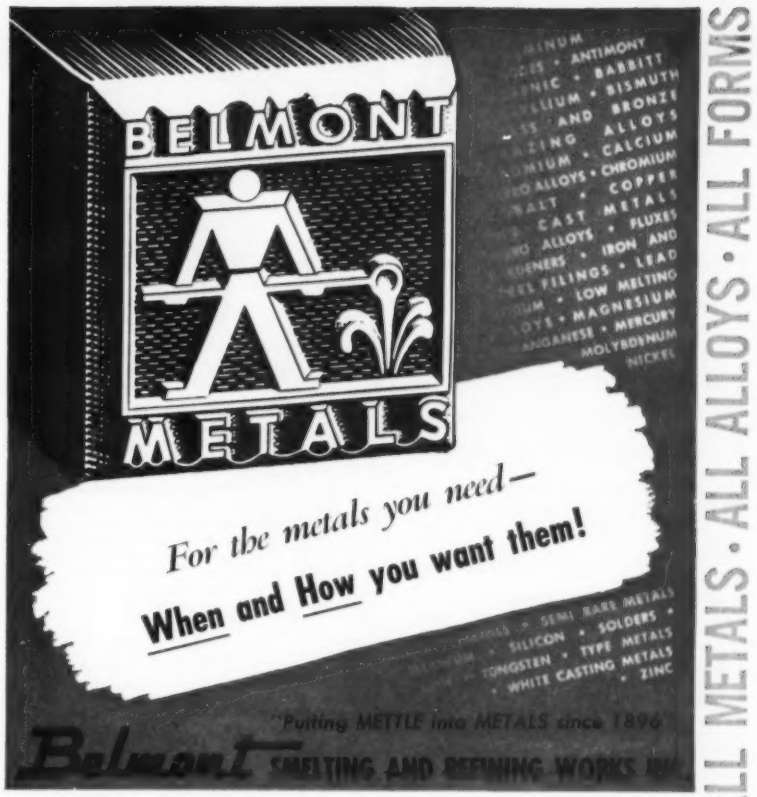
9. . Central Ohio
Seneca Hotel, Columbus, Ohio. C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago. *"Mechanization of Molding."*

9. . Michiana
Morris Park Country Club, South Bend, Ind. Round table discussion: Non-Ferrous—James Strom, Strom Brass Foundry, Elkhart, Ind. and Arthur I. Rupp., Bendix Aviation Corp., South Bend, Ind. Ferrous—Lewis Reiff, Superior Steel & Malleable Casting Co., Benton Harbor, Mich.

9. . Cincinnati District
L. D. Richardson, Eutectic Welding Alloys Corp. Flushing, N. Y. *"Welding of Gray Iron Castings."*

9. . Timberline
Oxford Hotel, Denver, Colo. William A. Hambley, Krause Milling Co., Birmingham, Mich. *"Casting Defects."*

10. . N. Illinois-S. Wisconsin
Faust Hotel, Rockford, Ill. Roy W.


BELMONT
METALS
For the metals you need—
When and How you want them!
"Putting METTLE into METALS since 1896"
Belmont SMELTING AND REFINING WORKS INC.
ALL METALS • ALL ALLOYS • ALL FORMS
301 Belmont Avenue, Brooklyn 7, N. Y. Dickens 2-4900

SEMET-SOLVAY
FOUNDRY COKE
"for Better Melting"
This is not just a tricky catch phrase. It's what you get when you use Semet-Solvay Foundry Coke in your cupolas. What is "better melting"? It's melting your iron *hotter, faster, cleaner.*
SEMET-SOLVAY DIVISION
Allied Chemical & Dye Corporation
CINCINNATI • DETROIT • BUFFALO
In Canada: SEMET-SOLVAY COMPANY, LTD., TORONTO
for Better Melting

WANTED

Foundry Engineer

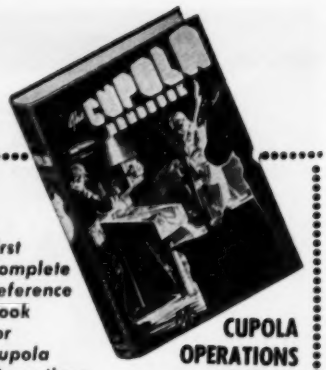
Thoroughly familiar with all phases of foundry and machine shop practices necessary as related to Steel, Iron and malleable Castings. Must be capable of instituting cost and reduction program on castings. Write us today stating your qualifications:

R. W. Ager

HYSTER COMPANY

P. O. Box 4318

Portland 8, Oregon



First Complete Reference Book for Cupola Operations

CUPOLA OPERATIONS HANDBOOK

Complete reference book on Cupola Operation in all its phases. A total of 128 outstanding foundry metallurgists and cupola operators contributed to text.

Highlights include: Operation of the Cupola, The Refractory Lining, Blowing Equipment and Blast Control Equipment, Forehearth and Receiving Ladles, Blast Conditioning, Classification of Scrap for Cupola Mixtures, Foundry Coke, Cupola Slags, Fluxes and Fluxing, and Fundamental Thermo-Chemical Principles Applicable to Cupola Operation.

First Edition — cloth bound . . . 468 pages . . . 188 graphs and illustrations . . . 34 tables . . . extensive bibliographies and index.

$6.00 A.F.S. Member Price
$10.00 Non-Member Price

AMERICAN FOUNDRYMEN'S SOCIETY
616 S. Michigan Ave. Chicago 5, Ill.

MAYLINE

Mayline —

A Distinctive Name in Drafting Room Furniture

Offers These Special Features In Its Mayline 4-Post Tables

- **DROP-IN STEEL HINGES**
- **SOLID BASSWOOD TOP**
- **RIGID STEEL END CLEATS**
- **NATURAL FINISH BASE**

MAYLINE

MAYLINE

Accessory products: Plan Files and Drawer Units—Auxiliary Drawer Units—Straightedges—T-Squares—Sensitized Paper Dispensers—Stools.

Sold Nationally Thru Dealers

ENGINEERING MANUFACTURING COMPANY

605 North Commerce Street • Sheboygan, Wisconsin

MAYLINE

MAYLINE

coming events

Schroeder, University of Illinois, Navy Pier Branch, Chicago. *"Development of Foundry Courses in High and Trade Schools."*

12. . St. Louis District
York Hotel, St. Louis, Mo. National Officers' Night. I. R. Wagner, A.F.S. President, and Wm. W. Maloney, Sec.-Treas.

12. . Northeastern Ohio
Tudor Arms Hotel, Cleveland. Foundry Educational Foundation sound movie. National Directors H. G. Robertson, American Steel Foundries, Alliance, Ohio. Local apprentice contest winners. Technical speakers from FEMA.

13. . Wisconsin
Hotel Schroeder, Milwaukee. General meeting.

13. . Philadelphia
Engineers' Club, Philadelphia. Thomas J. Wood, American Brake Shoe & Casting Div. American Brake Shoe Co., Mahwah, N. J. *"Acid vs. Basic Lining for the Cupola."*

13. . Tri-State
Wichita, Kansas.

13. . Central New York
Non-Ferrous Night. William Mader, Oberdorfer Foundries. Syracuse, N. Y.

13. . Southern California
Roger Young Auditorium, Los Angeles. William S. Pellini, Metal Processing Branch, Metallurgy Div., Naval Research Laboratory, Washington, D. C. *"Engineering Aspects of the Performance of Castings and Weldments."*

16. . Northern California
Hotel Shattuck, Berkeley, Calif. William S. Pellini, Metal Processing Branch, Metallurgy Div., Naval Research Laboratory, Washington, D. C. *"Metallurgical & Mechanical Aspects of Hot Tearing."*

16. . Quad-City
Hotel Ft. Armstrong, Rock Island, Ill. Walter Sokolofsky, Monsanto Chemical Co., Springfield, Mass. *"Shell Molding."*

17. . Eastern New York
Circle Inn, Latham, N. Y. Richard Herold, Foundry Products Dept., Borden Co., New York. *"Shell Molding."*

18. . Central Michigan
Hart Hotel, Battle Creek, Mich. A. J. Grindle, Grindle Corp., Markham, Ill. *"Dust, Smoke & Fume Control."*

18. . Oregon
Portland, Ore. William S. Pellini, Metal Processing Branch, Metallurgy Div., Naval Research Laboratory, Washington, D. C. *"Feeding Range of Risers."*

19. . Washington
Everett, Wash. William S. Pellini, Metal Processing Branch, Metallurgy Div., Naval Research Laboratory, Washington, D. C. *"Feeding Range of Risers."*

19. . Detroit
Detroit-Leland Hotel, Detroit. Sustaining members night. Gosta Vennerholm, Ford Motor Co., Dearborn, Mich. *"Developments in Shell Molding."*

19. . Penn State Student Chapter
Foundry Classroom. Penn State College, Pa. J. D. Caster, Harbison-Walker Refractories, *"Foundry Refractories."*

free information

continued from page 104

For further information about free literature use the card on page 104.

ing equipment, range of particle sizes, concentrations and collector performances, drawings of different types of dust collectors, list of practical "Don't's" and other data on selection, installation and operation of dust collection equipment. *American Air Filter Co.*
For more data circle No. 22 on card, page 104

Small foundry equipment

A description of how a small foundry, Georgia Iron Works, at Augusta, has increased output from 7,500 pounds to 15,000 pounds of castings daily with one-third the manpower is contained in bulletin now available. Contains pictures of speedmullor-preparator unit, sandslinger, and mulbaro which helped make record possible. *Beardsley & Piper.*
For more data circle No. 23 on card, page 104

Double-auger tuyeres

One-page bulletin listing series of simple questions by which foundrymen may quickly determine whether use of double-auger tuyeres would result in greater economy and efficiency in their particular operation. *Sprow Tuyeres Co.*
For more data circle No. 24 on card, page 104

Resin core binders

"Cyacor Resins—Their Use as Core Binders" is title of booklet which describes Cyacor 151, an extremely stable, dry, powdered urea-formaldehyde resin particularly effective for dry sand and Cyacor 191, low viscosity urea-formaldehyde resin solution that can be used with both wet and dry sands. Use of these Resins is said to speed up production of cores by reducing baking time from 33 to 50 per cent over that of oil binders, and make possible lower baking temperatures, thus cutting fuel costs. *American Cyanamid Co.*
For more data circle No. 25 on card, page 104

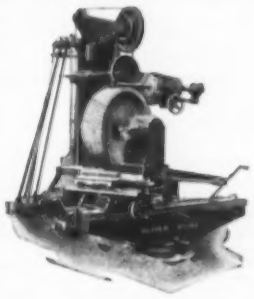
▶ *New England Foundrymen elect officers for 1953*

The 57th annual meeting of the New England Foundrymen's Association convened Wednesday, January 14, 1953, on the Parker House Roof in Boston, Mass. Over 225 members and guests enjoyed a delicious turkey dinner and entertainment arranged by the out-going officers under the excellent leadership of Frank R. Elliot, immediate past president. Officers and executive committee members elected for 1953 are: Joseph B. Stazinski, General Electric Co., Everett, Mass., *president;* Henry G. Stenberg, Draper Corp., Hopedale, Mass., *vice president;* Thomas I. Curtin, Waltham Foundry Co., Waltham, Mass., *secretary-treasurer.*

They like our service, too. Write for Bulletin

THE SCIENTIFIC CAST PRODUCTS CORP.
1390 East 40th Street
CLEVELAND 3, OHIO
2520 West Lake Street
CHICAGO 12, ILLINOIS

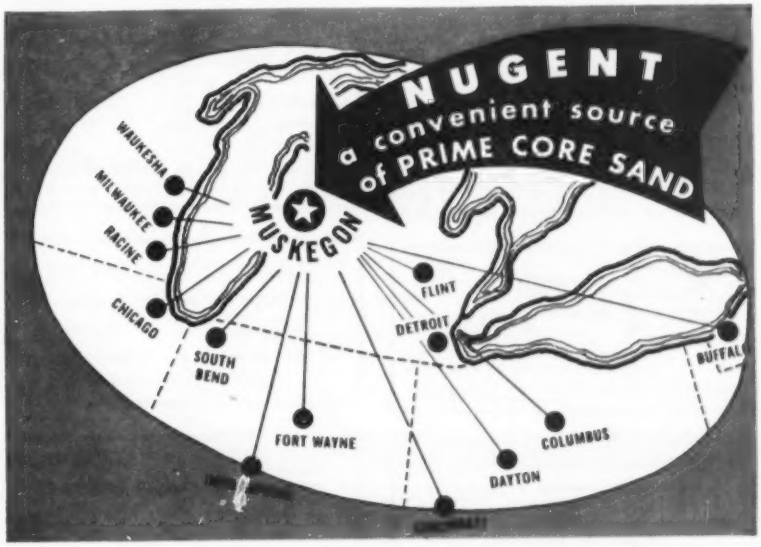
"OLIVER"
No. 102 Universal
PATTERN MILLER
for wood and soft metals



Cuts production time 25%

The "Oliver" No. 102 Pattern Miller cuts patterns for spiral, bevel and worm gears at savings up to 25% in time. And finishes core boxes at savings up to 75% in time. Does accurate, smooth work. Unlimited capacity. Used by leading engineering firms throughout the world. Ask for Bulletin No. 102.

OLIVER MACHINERY COMPANY
GRAND RAPIDS 2, MICHIGAN



Call or write your Nugent Representative today

INDIANA PRODUCTS CO.
Kokomo, Indiana

WARNER R. THOMPSON CO.
Detroit 8, Michigan

KEENER SAND & CLAY CO.
Columbus 15, Ohio

CARPENTER BROTHERS, INC.
Milwaukee 3, Wisconsin

GREAT LAKES FOUNDRY SAND CO.
Detroit 26, Michigan

1912 CANNON 1953
core sand
THE NUGENT SAND COMPANY, INC.
MUSKEGON, MICHIGAN

classified

■ To contact advertisers with code number, write to AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill. In replying to "Help Wanted," send outline of background.

▶ Help Wanted

Superintendent

Opportunity for well qualified, experienced superintendent of non-ferrous foundry employing 100 to 150. Applicant should be between 35 and 45. Enclose photograph and state complete record of education and experience in detail including previous employment and length of service. **HW-602**

Metallurgists

Two recently graduated metallurgists, one to handle cupola operation problems and assist melting foreman. One to work on new methods of operation and metallurgical problems in modern, progressive malleable iron foundry in northeastern Ohio. State experience, references, salary. **HW-629**

Metallurgists Sales & Service

Nationally known producer of foundry coke desires metallurgist with melting experience for sales and cupola service over large territory. Give experience, education, age and salary expected. Replies treated confidentially. **HW-630**

Foundry Supervisory Personnel

Qualified foreman for all operations in highly mechanized, established malleable foundry. Positions open immediately. Must be familiar with progressive foundry techniques. State qualifications. Located Midwest. **HW-631**

Foundry Engineers and Draftsmen

Having foundry operating or plant experience. Write, enclosing photograph and complete record of education and experience in detail, including previous employers and length of service. State age and salary expected.

Lester B. Knight & Associates, Inc.
Consulting Engineers
600 W. Jackson Blvd. Chicago 6, Ill.

Metallurgist-Sand Control

Large jobbing gray iron foundry in Middlewest wants metallurgist and sand control man. Must have degree in metallurgy. Capable of supervising pouring of large gray iron castings. Send resume of education, experience and salary requirements. **HW-632**

Steel Inspector

Experienced in gating, risering, and pattern layout. Chicago area. **HW-633**

Foreman Cleaning Room

Steel cleaning room foreman to supervise cleaning, chipping, welding and inspection in modern steel foundry. Chicago area. **HW-634**

Foundry Superintendent

Unusual opportunity in medium size brass, aluminum and iron foundry. Long-term expansion program requires superintendent with thorough knowledge of machine and floor molding, gating and setups for jobbing and production work. Applicant must know all phases of foundry work and be capable of producing pressure-tight and porous-free castings economically. Prefer applicant not over 45. **HW-635**

Working Foreman

Small, fully-mechanized jobbing foundry mostly aluminum, some brass. Castings for industrial and aircraft precision use. Assume complete supervision of shop and production. Permanent mold knowledge desirable, not mandatory. Complete work resume in first letter, please. Southwest location. **HW-636**

Field Service Men

Excellent opportunity for men to demonstrate correct use of synthetic resin core binders in midwest. Car, salary, bonus and expense account. Give full details and references. **HW-637**

▶ For Sale

Blast Equipment

No. 4 Sly blast mill and dust collector. Condition excellent. New barrel recently installed. Price $1200.

Union Chain & Manufacturing Co.
Sandusky Ohio

Crane

40 ft. motorized, Cleveland Tramrail Crane —2,000 lb capacity—5 speed electric hoist. Conductors included but no track.

LaPorte Foundry Co.
La Porte, Ind. Phone 3154

▶ Positions Wanted

Sales or Junior Management

Graduate of University of Texas, 1952, degree in business administration, wants job in sales or supervision with chance to work up. Have steel foundry cleaning room supervisory experience; also have been expediter, and some non-foundry retail sales experience. Prefer location in Southwest. **PW-185**

Permanent Mold Specialist

Specialist in brass permanent mold fittings disposing of a process of his own, offers his services for setting up the casting process. Smooth, dense castings, permanent in size, guaranteed. **N-142**

▶ Professional Services

METALLURGICAL
CHEMISTS *Accuracy* CONSULTANTS *Service*
ACCURATE METAL LABORATORIES
2454 W. 38th St. • Phone: VI 7-6090 • Chicago 32, Ill.

engineers consultants management
Trouble Shooting Technical & Cost
CARL E. ROWE & COMPANY
125 E. Wells St. Milwaukee 2, Wis.
Phone Marquette 8-2851

Westover ENGINEERS
FOUNDRY MANAGEMENT CONSULTANTS
3110 West Fond Du Lac Ave., Milwaukee 10, Wis.
There is no better time than NOW to review incentives, methods, scheduling, production control and paperwork processes.

EARL E. WOODLIFF
FOUNDRY SAND ENGINEER
Consulting • • Testing
14611 Fenkell (5-Mile Rd.) Detroit 27, Mich.
Res. Phone Vermont 5-8724

GEO. N. WILEMAN
Consulting Engineers
to
The Foundry Industry
Plant & Equipment
Commercial Trust Bldg. Philadelphia 2, Penna.

SESSIONS ENGINEERING CO.
Consulting Foundry Engineers
Modernization, Processing Layouts
Cost Reduction Quality Control
Product—Machine Design
Architectural Design
One North La Salle St. Chicago 2, Ill.

W. G. REICHERT ENGINEERING CO.
PROFESSIONAL FOUNDRY ENGINEERS
Surveys • Modernization
Operations • Management
1060 Broad St. Newark 2, N. J.
Industrial Bldg.

Harold J. Roast
F.I.M., F.C.S., M.E.I.C.
BRONZE FOUNDRY CONSULTANT
c/o Crown Trust Co.
284 Dundas St. London, Ont., Canada
Available Coast to Coast

Lester B. Knight & Associates, Inc.
Member A.C.M.E.
Consulting Engineers
Management • Sales • Production • Surveys
Modernization • Mechanization
600 West Jackson Blvd., Chicago 6, Ill.
Eastern Office: Lester B. Knight and Associates
50 Church St., New York 7, N. Y.

CHEMISTS and METALLURGISTS
Grey Iron Foundry Consultants
Complete Foundry Testing
Established over 25 years
A. H. PUTNAM COMPANY
Rock Island, Illinois

X-RAY INSPECTION
SPECTROCHEMICAL ANALYSIS
TESTING AND RESEARCH
METALLURGICAL AND CERAMIC FIELDS
Centrally located in New England
J. DIRATS & CO., INC.
Notre Dame St. Westfield, Mass. Phone 2260

index to Advertisers

107 Ajax Electrothermic Corp.
32-33 Allis-Chalmers Mfg. Co.
110 American Lava Corp.
80 American Monorail Co.
Back Cover Apex Smelting Co.
Inside Back Cover Archer-Daniels-Midland Co. (Foundry Products Div.)
93 Bakelite Co., A Division of Union Carbide & Carbon Corp.
85 Baroid Sales Div., National Lead Co.
67-68 Beardsley & Piper, Div. Pettibone Mulliken Corp.
115 Belmont Smelting & Refining Works
11 Carl-Mayer Corp.
23 City Pattern Foundry & Machine Co.
118 Classified Advertisers
20 Cleco Division of the Reed Roller Bit Co.
31 Cleveland Flux Co.
9 Cleveland Metal Abrasive Co.
112 Cleveland Vibrator Co.
34 Crucible Manufacturers Assn.
Delta Oil Products Co.
14 Detroit Electric Furnace Div., Kuhlman Electric Co.
98 Electro Metallurgical Co., A Division of Union Carbide & Carbon Corp.
116 Engineering Manufacturing Co.
77-78 Fanner Mfg. Co.
1 Federal Foundry Supply Co.
111 Federated Metals Div., American Smelting & Refining Co.
82 Giffels & Vallet
27 Girdler Corp.
112 Gordon, Claud S., Co.
26 Great Lakes Carbon Corp., Electrode Div.
106 Hickman, Williams & Co., Inc.
116 Hyster Co.
2 Induction Heating Corp.
96 Industrial Equipment Co.
5 International Nickel Co.
24-25 Jeffrey Mfg. Co.
90 Lindberg Engineering Co., Fisher Furnace Div.
19 Link-Belt Co.
108 Martin Engineering Co.
89 Monsanto Chemical Co., Plastics Div.
28 National Carbon Co., A Division of Union Carbide & Carbon Corp.
12-13 National Engineering Co.
106 National Metal Abrasive Co.
99 Newaygo Engineering Co.
117 Nugent Sand Co.
117 Oliver Machinery Co.
87 Orefraction Inc.
114 Ottawa Silica Co.
95 Pangborn Corp., Malleabrasive Div.
4 Pennsylvania Glass Sand Corp.
Inside Front Cover Pittsburgh Lectromelt Furnace Corp.
15 Reichhold Chemicals, Inc.
8 Royer Foundry & Machine Co.
16 Schneible, Claude B., Co.
117 Scientific Cast Products Corp.
115 Semet-Solvay Div., Allied Chemical & Dye Corp.
100 Simplicity Engineering Co.
10 Sterling Wheelbarrow Co.
21 Stevens, Frederic B., Inc.
6 Taylor, Chas., Sons Co.
102 Tennessee Products & Chemical Corp.
109 Toledo Scale Co.
105 U. S. Graphite Co.
Union Carbide & Carbon Corp.
93 Bakelite Co.
98 Electro Metallurgical Co.
28 National Carbon Co.
113 Wiegand, Edwin L., Co.

AMERICAN FOUNDRYMEN'S SOCIETY

97 Foundry Work
114 Foundry Sand Handbook
116 Cupola Handbook
119 American Foundryman
119 A.F.S. Membership
120 Book List

▶ *Demand for booklets high*

Report No. 2, *"Risering of Gray Iron Castings,"* has just been reprinted to meet demands of foundrymen. Previously, Report No. 1 was reprinted to meet industry requirements. These two popular publications, progress reports on A.F.S.-sponsored research, are available to members for $1.00 a report. Nonmember price is $2.00.

▶ *Correction*

In the article by Hiram Brown entitled *"Advantages and Disadvantages of Light Metal Melting Equipment"* in the December 1952 issue of AMERICAN FOUNDRYMAN, the composition of a special steel was given. Reference to the fact that this analysis is patented was inadvertently omitted. The steel, called Amera-Mag, was developed especially for magnesium melting pots; U. S. Patent No. 2467701 and Canadian Patent No. 463381 are owned by John J. Ripich, president, American Tank & Fabricating Co., Cleveland.

CONTACT THE FOUNDRY MARKET
WITH THESE SERVICES

- **Classified Advertising** — Rate $10 per column inch
- **Employment Service** (Position and Help Wanted) — "Position Wanted" Ads $5. "Help Wanted" Ads $10.
- **Professional Card Advertising** for Engineers and Consultants — Rate $10 per column inch insertion

American Foundryman

616 S. Michigan Ave. **Chicago 5**

A.F.S.

Membership

. . . AN INVESTMENT IN PROGRESS

"The man who does not keep closely in touch with his competitors in these days is likely to find himself far behind in the race. No man has a monopoly of the good ideas in any branch of industry, and there is no man who is so well informed, so thoroughly conversant with the details of his own business, that he can learn nothing by discussions with his fellow manufacturers. Those who know the most, those who are most progressive in their business, are most willing to acquire new ideas which will place them still further in the lead."

These thoughts formed the keynote of the A.F.S. Inaugural Meeting, in 1896 . . . today, in this era of keen competition, the wisdom is equally sound.

Membership in the American Foundrymen's Society continues to present unusual opportunities for making new friends throughout the foundry industry . . . through Committee service, Chapter meetings, and the annual Foundry Congress . . . friends with whom you can discuss a solution to common foundry problems.

AMERICAN FOUNDRYMEN'S SOCIETY
616 South Michigan Ave., Chicago 5, Illinois

A.F.S. Publications

	Publication Number	A.F.S. Members	Non-Members
Books			
Alloy Cast Irons Handbook (2nd Edition)	1	$2.75	$4.50
Analysis of Casting Defects	3	2.50	4.25
Copper-Base Alloys Foundry Practice	57	3.75	5.75
Cupola Operations Handbook	7	6.00	10.00
Development of Metal Castings Industry	8	3.00	6.00
Foundry Core Practice (2nd Edition)	38	6.50	10.00
Foundry Sand Handbook (6th Edition)	12	3.50	5.25
Foundry Work	50	1.76	1.76
Patternmaker's Manual	61	4.50	6.75
Recommended Practices for Sand Casting Aluminum & Magnesium Alloys	24	1.00	1.75
Symposia			
Foundry Dust Control	10	1.00	2.00
Malleable Foundry Sand and Core Practice	16	2.00	3.25
Sand Test Data for Production of Steel Castings	47	3.00	4.75
Symposium on Air Pollution	62	1.75	2.50
Symposium on Principles of Gating	56	4.00	5.75
Foundry cost booklets			
Classification of Foundry Cost Factors	6	1.00	2.00
Foundry Cost Methods	9	1.50	3.00
Recommended practices—safety and hygiene			
Fundamentals of Design, Construction and Maintenance of Exhaust Systems	19	3.00	5.00
Good Practices for Metal Cleaning Sanitation	20	1.25	2.25
Grinding, Polishing and Buffing Equipment Sanitation	22	.75	.75
Health Protection in Foundry Practice	59	3.00	4.50
Safety Practice for Protection of Workers in Foundries	21	1.25	2.25
Testing and Measuring Air Flow	26	1.00	2.00
Annual Transactions			
Volume 53—1945	30	4.00	15.00
Volume 54—1946	31	4.00	15.00
Volume 55—1947	32	4.00	15.00
Volume 57—1949	33	8.00	15.00
Volume 60—1952	60	8.00	15.00
Index to AFS Transactions (1930-1940)	36	1.00	2.00
Education			
Apprentice Training Standards for the Foundry Industry	29	1.00	2.00
Foundry Apprentice Course Outline	39	1.00	2.00
Guide for Foremen Training Conferences	34	1.50	2.25
A. F. S. research progress reports			
Light Metals—A Study of the Principles of Gating	54	1.00	1.50
Light Metals—Principles of Gating as Applied to Sprue-Base Design	58	.50	.75
Brass and Bronze—Melt Quality and Fracture Characteristics of 85-5-5-5	55	1.00	1.50
Gray Iron—Risering of Gray Iron Castings—Report No. 1	42	1.00	2.00
Gray Iron—Risering of Gray Iron Castings—Report No. 2	43	1.00	2.00
Malleable—Surface Hardening of Pearlitic Malleable Irons	52	.40	.60
Steel—Steel Sands at Elevated Temperatures (Tenth)	53	.40	.60
A. F. S. special publications			
Bibliography of Centrifugal Casting	35	1.50	2.25
Cupola Research Committee Reports	49	1.00	1.50
Engineering Properties of Cast Iron	46	2.25	3.50
85-5-5-5 Test Bar Design (Fourth Annual Lecture—1946)	37	1.00	2.00
Gating Terminology Chart (Discount on Quantity Lots)	14	.10	.25
Graphite Classification Chart (25 x 38 in.)	44	1.25	1.75
Pattern Standard Color Chart (Discount on Quantity Lots)	51	.10	.25
Permanent Mold Castings Bibliography	18	1.50	3.00
Statistical Quality Control for Foundries (Available January, 1953—Price to be determined)	63	—	—
Other publications			
Aluminum Foundry Process Control (SAE)	2	1.00	2.50
American Malleable Iron—a Handbook	64	4.00	4.00
Ferrous Foundry Process Control (SAE)	11	1.50	2.50
Gates and Risers for Castings (Penton Pub. Co.)	40	6.00	6.00
Non-Ferrous Melting Practice (AIME)	41	3.00	3.50

Please send books circled

AMERICAN FOUNDRYMEN'S SOCIETY
616 South Michigan Avenue, Chicago 5, Illinois

Please send the books circled below. $_____ remittance enclosed.

1 2 3 6 7 8 9 10 11 12 14 16 18 19 20 21 22
24 26 27 29 30 31 32 33 34 35 36 37 38 39 40 41 42
43 44 45 46 47 49 50 51 52 53 54 55 56 57 58 59 60
61 62 63 64

Name _____

Address _____

City _____ Zone _____ State _____

Company _____

AFS pays postage when remittance accompanies order.

inseparable for over 1/4 century

HOE

Setting cores in dry sand mold to produce an 800-lb. ink rail for the famous HOE Printing Press.

THE LOGICAL OIL

uniform

LINOIL

plays important part in production of quality cores at . . .

R. HOE & CO., INC.

The Dunellen (N. J.) Foundry Division of R. Hoe & Co., Inc., pours semi-steel castings of all sizes for their famous high-speed printing presses. Giant machine tool bases ranging up to nine tons is also their business.

The size and cost of such work calls for fool-proof cores, unvarying in strength, hardness and collapsibility. That's why the core room foreman at Hoe has used trouble-free LINOIL for 26 years! They can depend upon its uniformity to produce consistent cores without having to vary the mixture from month to month.

Your LINOIL representative will be pleased to demonstrate LINOIL in your core room. Ask him next time he calls, or write direct to the address below for more information.

Cores for ink rails (see above) are made ready for over-night bake at 375-400 in oil-fired batch-type oven. Sand-LINOIL ratio of 50 to 1 by volume is used.

just off the press!

New bulletin on Archer LIN-O-CEL Sand Stabilizer tells how to improve flowability, prevent rat-tails, buckles and scabs. Write for your copy TODAY.

ARCHER-DANIELS-MIDLAND COMPANY

FOUNDRY PRODUCTS DIVISION • 2191 WEST 110th ST. • CLEVELAND 2, OHIO

producers of **LINOIL** **INDUCTOL** **FREFLO** **LIN-O-CEL**

APEX

aluminum
magnesium
zinc
alloy ingot

symbol of quality

Research leadership back of every Ingot

CHICAGO · CLEVELAND · LOS ANGELES · APEX SMELTING CO.